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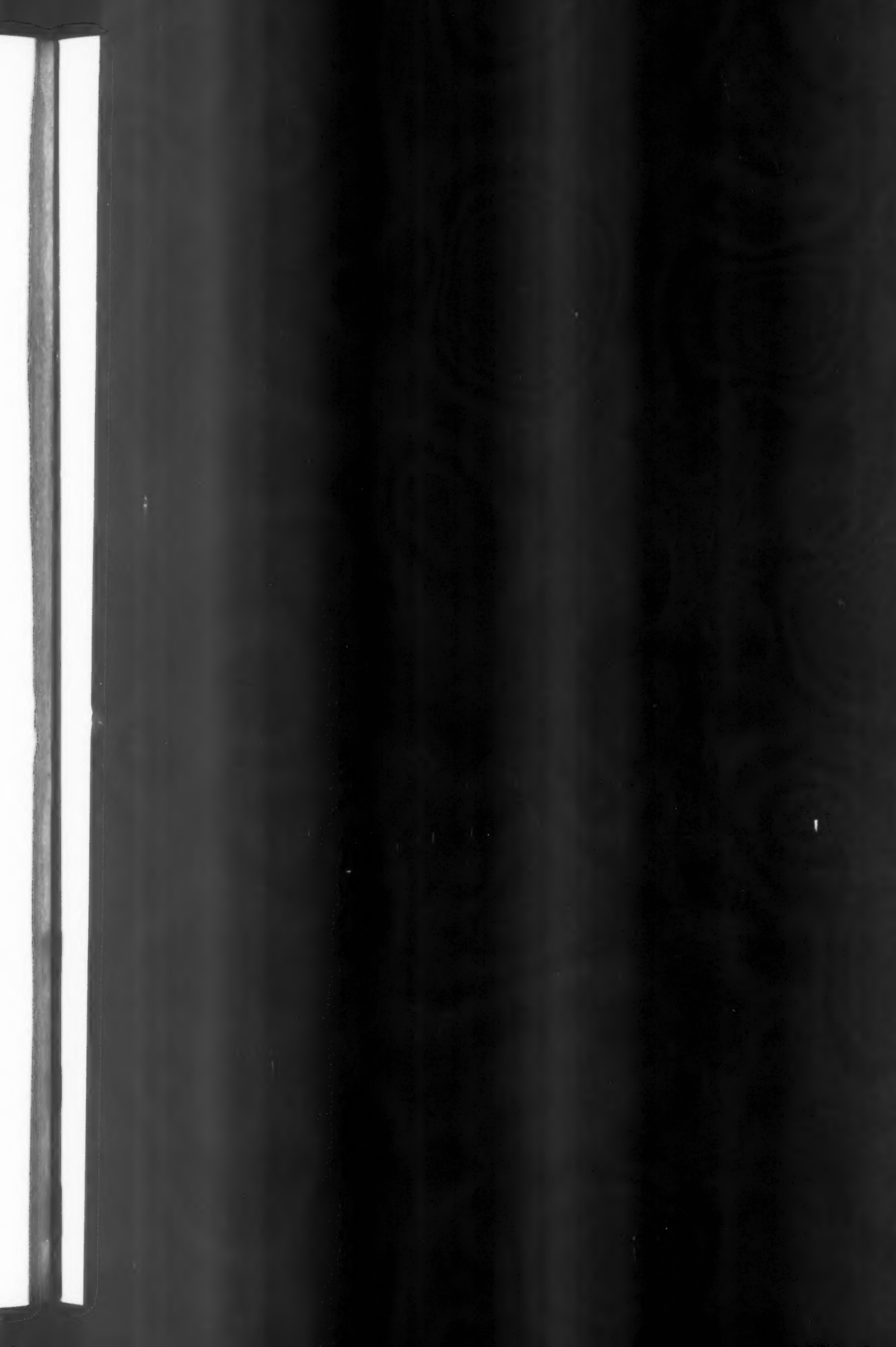
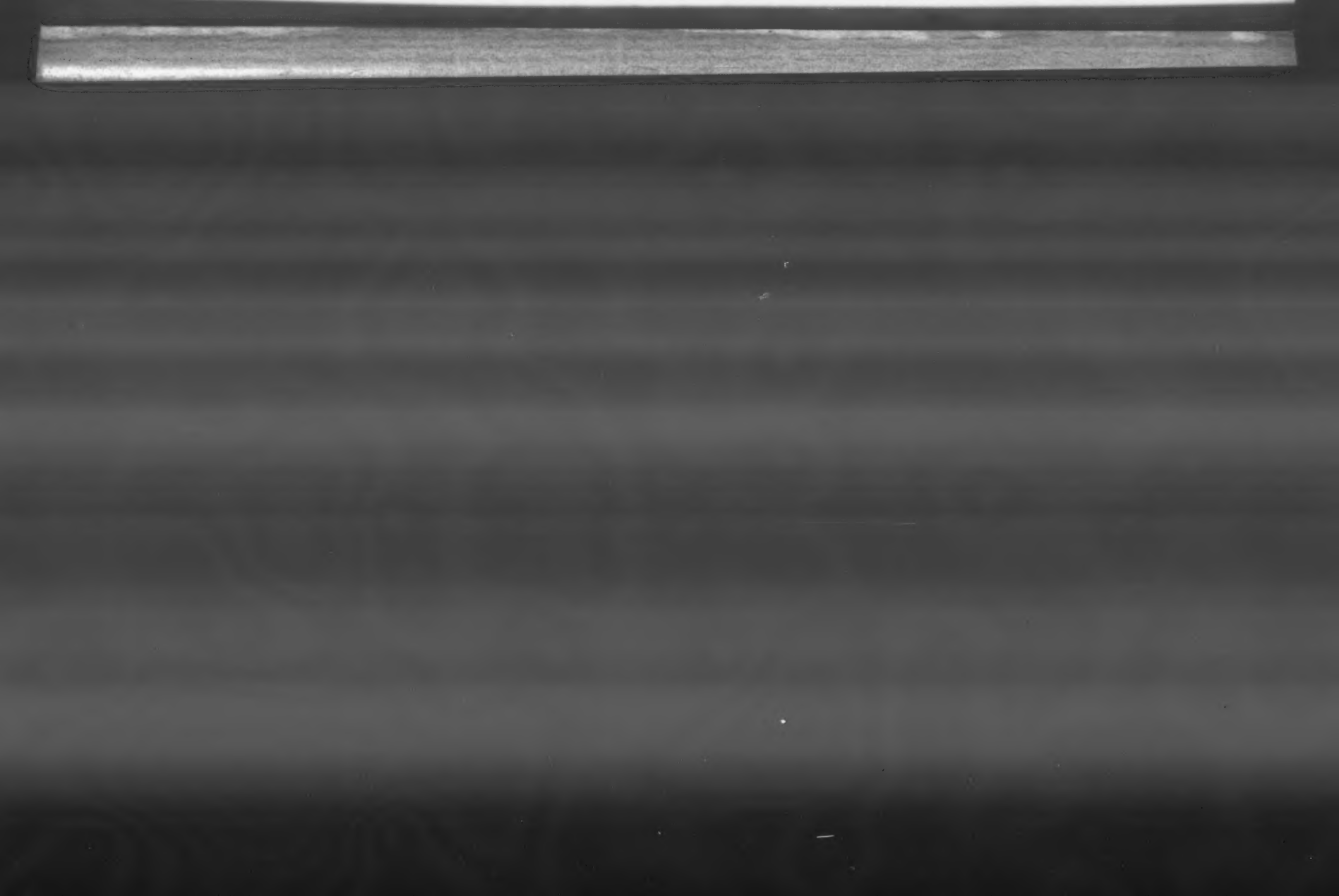




MUNICIPAL ENGINEERING

VOLUME XXXIII. AUGUST, NINETEEN HUNDRED SEVEN. NUMBER TWO.

THE METROPOLITAN WATER SUPPLY SYSTEM.

RESERVOIRS, AQUEDUCTS AND PUMPING STATIONS.

By Caleb Mills Saville, M. Am. Soc. C. E., Brookline, Mass.

As has been previously stated the Metropolitan Water Commission took possession of the partially constructed Sudbury dam and reservoir which the city of Boston had under way in 1895 and carried it to completion.

The length of the dam is 1,865 feet and the height of the water level on the dam at high water is 65 feet above the surface of the ground. There is a masonry spillway 300 feet long about the middle of the dam, the remainder of which is an earth embankment containing a masonry core wall built down into bed rock and plastered on the up-stream side. The material forming the embankments was deposited in thin layers and well watered and rolled. The slope of the dam on the down-stream side is 2 horizontal to 1 vertical except on the berms where the slope is not quite as steep. The up-stream side is paved or riprapped. Water can be drawn at different levels and the overflow from the spillway is led down to the Framingham Reservoir below.

The entire surface of the reservoir was stripped of loam and soil to a places as was impracticable on account depth of 12 inches except in such of the depth of the mud. In such places the excavation was carried to a depth of 10 feet, at which point very little organic matter was found.

The cost of this work to January 1, 1900, was:

Dam, including preliminary work	$ 648,410
Reservoir construction, including engineering, etc.	1,620,640
The purchase of land, legal and expert expense	648,196
Total cost	$2,917,246

The area of the reservoir is 2.02 sq. miles; its depth from 8 to 65 feet and its storage capacity 7,253,500,000 gals.

The work was begun in 1894 and substantially completed March, 1898.

—The Framingham Reservoirs.—

Above the point of diversion for water supply purposes the Sudbury River has a drainage area of 75.2 sq. miles. By building a series of dams on the river itself and improving the capacity of several natural ponds the city of Boston, previous to its taking by the Metropolitan Water Commission, had since 1872 developed or had in proces of construction eight storage reservoirs, having an aggregate capacity of 13,616,000 gals., and it was estimated that the average daily yield of the watershed thus developed was about 53.5 mil. gals. No attempt was made to remove the soil from these reservoirs, at the time of construction, but some work was done later at a cost of about $200,000. The dams of all of these reservoirs except that of the Sudbury, which has just been mentioned, were earth embankments containing concrete or rubble masonry core walls. The slopes generally are 2½ horizontal to 1 vertical in the down stream side and 1½ to 1 on the upstream side, covered with riprap or paving. The tops of the dams are generally about 18 or 20 feet wide.

—The Sudbury Aqueduct.—

The Sudbury Aqueduct was constructed by the city of Boston in 1878 for the purpose of bringing the waters from the Framingham Reservoirs to Chestnut Hill Reservoir, a distance of about 17.4 miles. It is of horseshoe shaped section, constructed of brick and stone masonry laid in cement mortar. For a distance of 1½ miles from the gate house at the upper end it is 7

feet 6 inches wide, 6 feet 10½ inches high and has a fall of 1 foot in 2,275 feet. For the remaining distance the aqueduct is 9 feet wide 7 feet 8 inches high and has a slope of 1 foot per mile. Its capacity is 103,000,000 gals. per day. In wet sandy trenches a wooden platform was used as a support for the masonry structure. When there was deep mud and quick sand the timber foundation was supported on piles and in peaty meadows the material was removed and replaced by compacted gravel, which was laid in water and in thin layers and left to settle during the winter before being built upon.

In several places high embankments were necessary and the settlement has generally been found to be not more than ½-inch in forty feet. In two places the aqueduct crosses the valleys of streams on granite masonry arched bridges. That at Waban Valley is 586 feet long and consists of 9 semi-oval arches, each of 44 feet 8 inches span. Echo Bridge,, so called, over the Charles River at Newton, is 79 feet above the river bed, 475 feet long and consists of seven arches, of which the principal one of 129 feet span, springing from the rocky banks of the river and spanning its whole width, presents a most beautiful landscape effect with its natural setting of trees and rocks.

—Lake Cochituate.—

This was the first of Boston's public water supply basins. It is a chain of ponds about 3½ miles long, having an area of 776 acres and a watershed area of 18.87 sq. miles. At first no attempt was made to specially prepare this pond for water supply purposes, but in 1901 after its acquisition by the Metropolitan Water Board, about 80 acres were improved by the removal of organic matter and excavated to give a depth of 10 feet at high water. This work cost about $102,000. The storage capacity of this basin is 2,242,400,000 gals.

—The Cochituate Aqueduct.—

The Cochituate Aqueduct, 14.6 miles long, was built by the city of Boston about 1848. It is constructed of brick masonry 8 inches in thickness laid in cement mortar. It is of egg shaped section, with the large end down, 5 feet wide by 6 feet 4 inches high. At the Charles River crossing four lines of large sized cast iron pipes replace the brick section and are carried on a bridge of granite masonry having 3 elliptical arches of 30 feet span, 7½ feet rise and a width of 21 feet.

METROPOLITAN WATER WORKS, BOSTON, MASS.
Overflow of Dam, Sudbury Reservoir, Southborough.

—The Weston Aqueduct.—

Starting at the Sudbury dam and extending easterly, the Weston Aqueduct runs across country for 13.44 miles to the high land a short distance west of Charles River and about 7.5 miles west of Chestnut Hill Reservoir. This aqueduct is designed to have a capacity in all sections of 300,000,000 gals. per day. It is generally of horseshoe section and is built of cement concrete masonry. Natural cement was used on the sides and bottom and this portion was lined with 4 inches of brick work. The arch was built of Portland cement and has a thickness at the crown of from 7 to 18 inches. For the first 3½ miles the aqueduct is 10 feet wide by 9 feet 3 inches high, and has a fall of 4 feet in 5,000.

After crossing the N. Y., N. H. & H. R. R. the fall is reduced to 1 foot in 5,000 and the size increased to 13 feet 2 inches by 12 feet 2 inches. In crossing the valleys of the Sudbury River and a depression known as Happy Hollow riveted steel pipes 7½ feet in diameter

were substituted for the masonry section. The lengths of these crossings were 3,617 feet and 1,139 feet respectively. An interesting feature on the former crossing is the self supporting pipe arch across the Sudbury River. The span, between substantial masonry abutments, is 80 feet in the clear and the rise 5½ feet. The plates of the pipes in the arch are 3-16 inch thicker than those in the rest of the pipe, making their thickness 5-8 inch. About 11 miles from the Sudbury dam the masonry aqueduct discharges into an open channel 1,400 feet long, 12 feet deep, 10 feet wide at the bottom and having side slopes of 3 horizontal to 1 vertical. This channel leads to the Weston Reservoir, at the lower end of which there of the southern high service district. For the safe operation of the aqueduct it is necessary to have an equalizing reservoir at its lower end and a site suitable for such purpose was found in a natural valley, which was readily dammed by an earth embankment with a concrete core wall. All soil and organic matter was removed from the deeper portions of the reservoir and, where the depth at full reservoir would be less than 11 feet, excavation was made to this depth, thus incidentally increasing the natural capacity of the reservoir. The shores of the reservoir are protected by riprapping and coarse gravel beaches where conditions require. The reservoir and open channel have together an area of 666 acres. In

METROPOLITAN WATER WORKS, BOSTON, MASS.
Pipe Arch Bridge, Crossing of Weston Aqueduct, over Sudbury River.

is a screen chamber from which the aqueduct extends a little over a mile to the terminal chamber from which branch the pipes carrying water to the district. The total cost of the aqueduct to January 1, 1906, was $2,349,963 or about $175,000 per mile.

—The Weston Reservoir.—

About 1 mile westerly of the terminal chamber on the Weston Aqueduct and 8½ miles west of Chestnut Hill Reservoir is situated the Weston Reservoir, a large distributing and equalizing basin having a capacity of about 200,000,000 gals. The elevation of this basin is such that water can be delivered from it to the low service system of the city of Boston and when, in the near future, pipes are laid across country to Spot Pond, water can be delivered into that reservoir by gravity and the system of pumping now necessary to supply the northern low service system partially, at least, done away. At this time the pumps now used for this service will probably be needed by the ever increasing demands order to protect the storage from local pollution a system of drainage has been devised which will prevent the entrance of such water.

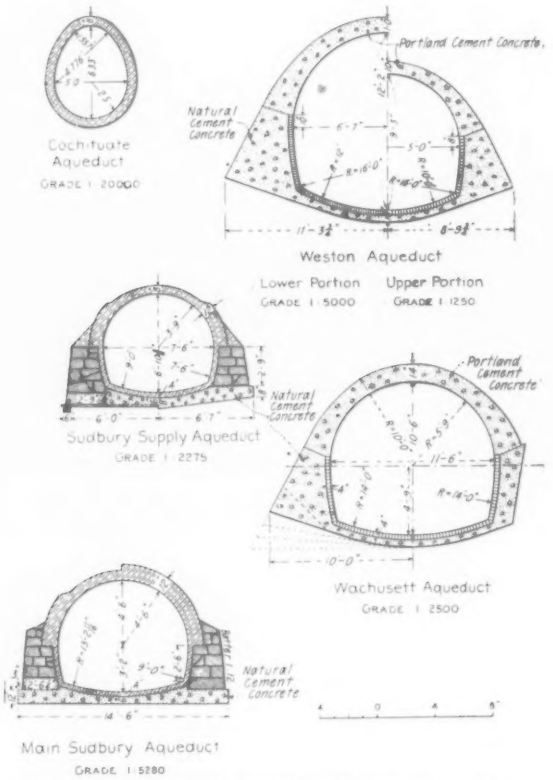
Especial attention has been given to the design of the outlines of this and the other reservoirs from a landscape viewpoint and the disposition of the excavated material was such as to obtain satisfactory effects. The well known firm of Olmstead Bros., landscape architects, have had this matter in charge and without much additional cost the reservoirs present a pleasing effect to the eye as well as serving the purpose for which they were created. The total cost of the reservoir to Jan., 1906, was $344,000, or $1,720 per mil. gals. stored.

—Pumping Stations.—

Water is delivered at Chestnut Hill Reservoir by the Sudbury and Cochituate Aqueducts, having a combined capacity of 118,000,000 gals. per day, while the 48-inch supply pipe line leading from the terminal chamber on the Weston Aqueduct brings an additional

supply of about 35,000,000 gals. per day. There can thus be delivered at this point 153,000,000 gals. per day exclusive of the storage in Chestnut Hill Reservoir. High water in this reservoir is at el. 137 feet above mean low tide, but as the greater portion of the city is above grade 30 and the buildings at this elevation have their top stories considerably above the ground, a gravity supply with proper fire protection for a large city is not available for any considerable portion of the district. Of the 118,389,000 gals. supplied on an average per day about one-fourth is delivered by gravity, the remaining part being pumped. Pumping stations have been erected in several parts of the district most available and the pumps deliver water into equalizing reservoirs or stand pipes located at high points on the system.

The main pumping stations are located at Chestnut Hill near the reservoir. Here there are two known as the high and low service stations. The low service station pumps water to Spot Pond distributing reservoir and to the territory in the northern part of the district, raising the water to el. 165. In this station are located three vertical triple expansion pumping engines designed by the Holly Mfg. Co., each having a pumping capacity of 35,000,000 gals. per day. The cost of this station was:



METROPOLITAN WATER WORKS, BOSTON, MASS.
Sections of Tunnels on Aqueducts.

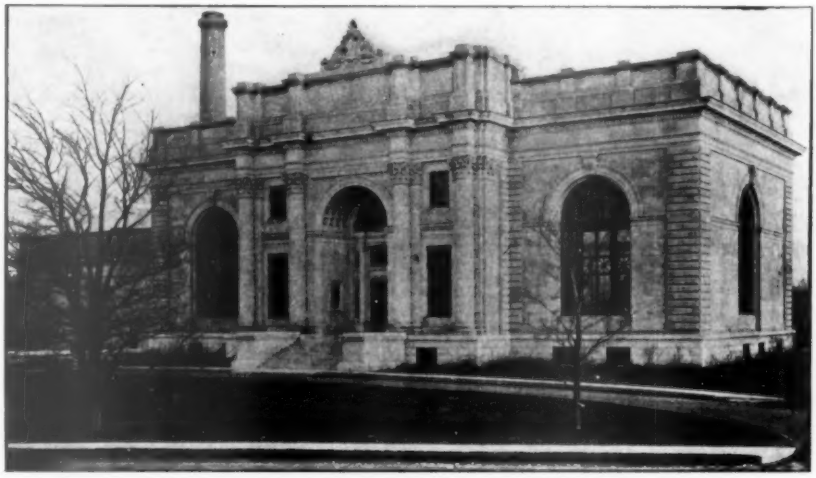
Building, including foundations for engines	$214,906.65
Engines	153,556.47
Boilers and fuel economizer	23,712.40
Electric lighting engine, generator and switch board	2,087.00
Traveling crane	2,812.00
Piping, valves and connections	16,043.16
Miscellaneous	5,894.51
Total cost	$419,012.25

The high service station which supplies the south and west parts of the district was built by the city of Bos-

ton and acquired by the Metropolitan Water Board at the time when the other portions of the works were taken.

When taken by the Metropolitan Water Board this station contained three pumping engines, two being 8,000,000 gal. Gaskell engines, built by the Holly Mfg. Co., and one a 20,000,000-gal. triple expansion engine designed by E. D. Leavitt. In 1898 a 30,000,000-gal. vertical triple expansion, crank and flywheel engine was erected. This was designed and built by the E. P. Allis Co., of Milwaukee, Wis.

To supply the northern portions of the district with water a pumping station was erected on the shore of Spot Pond distributing reservoir and the engines there deliver water to the high service reservoir in the Middlesex Fells and on Bear Hill. In this station are two pumping engines, one of 10,000,000 gals. daily capacity designed by E. D. Leavitt and erected by the Blake Mfg. Co.; the other of 20,000,000 gals. daily capacity erected by the Holly Mfg. Co.



METROPOLITAN WATER WORKS, BOSTON, MASS.
Chestnut Hill Pumping Station.

The cost of this station was:

Building, including foundations	$125,866.36
Engines	100,787.88
Boilers and fuel economizers	25,816.42
Electric lighting engine, generator and switch board	1,235.00
Traveling crane	2,862.00
Water and steam pipes, etc.	10,007.15
Miscellaneous	1,083.43
Total cost	$267,658.24

A STUDY OF MUNICIPAL OWNERSHIP AND OPERATION.

After an investigation extending over nearly two years and embracing many of the principal cities both of the United States and Great Britain, the National Civic Federation Commission on Public Ownership and Operattion has completed its self-imposed duties.

The Committee of Investigation of the Commission is composed of twenty-one members, as follows: W. D. Mahon, president of Amalgamated Association of Street and Electric Railways of America; Prof. John R. Commons, of the University of Wisconsin; J. W. Sullivan, editor of the weekly "Bulletin" of the clothing trades, and a prominent labor leader; Walton Clark, vice-president of the United Gas Improvement Company; Philadelphia; Daniel J. Keefe, president of the International Longshoreman, Marine and Transport Workers' Association; Walter L. Fisher, president of the Municipal Voters' League of Chicago; Melville E. Ingalls (chairman), chairman of the Cleveland, Cincinnati, Chicago and St. Louis Railroad Com-

pany; Prof. Frank J. Goodnow, of Columbia University; Dr. Albert Shaw (vice-chairman), editor of the "American Monthly Review of Reviews;" Edward A. Moffett (secretary), editor of the "Bricklayer and Mason;" Edward W. Bemis, superintendent of Waterworks, Cleveland, Ohio; Milo R. Maltbie, formerly editor of "Municipal Affairs," of New York; Charles L. Edgar, president of the Edison Electric and Illuminating Company, of Boston; H. B. F. Macfarland, Commissioner of the District of Columbia; W. J. Clark, foreign manager for the General Electric Company, New York City; Timothy Healy, president, International Brotherhood of Stationary Firemen; Dr. Talcott Williams, journalist; F. J. McNulty, president, International Brotherhood of Electrical Workers; Prof. John H. Gray, of Northwestern University; Prof. Frank Parsons, president of the National Public Ownership League, and Albert E. Winchester, general superintendent of the electric works of the City of South Norwalk, Conn.

The Commission has made an investigation of public and private operation of gas, water, electric lighting and power, and street railways, in the cities visited, in America and Great Britain. Fifteen members of the investigating committee visited the cities of Glasgow, Newcastle-on-Tyne, London, Liverpool, Norwich, Manchester, Birmingham, Dublin, Leicester and Sheffield. Investigations in the United States were made in Cleveland, Chicago, Philadelphia, Wheeling, Detroit, Indianapolis, Richmond, Atlanta, South Norwalk, Syracuse, Allegheny, New Haven and Hartford. A staff of engineers, accountants and statisticians numbering over twenty, of national reputation, were employed to examine every undertaking visited by the committee.

The first publication of results in the daily press was in the form of abstracts from reports or reviews by Prof. John R. Commons and J. W. Sullivan, representatives of two sides of the municipal ownership question, who discuss the labor question. Following are some if the salient points made by them:

Certain effects of the municipal ownership movement in Great Britain on the private companies are evident, says Professor Commons. The Sheffield Company, under the far-seeing management of Sir Frederick Mappin, has directed its policy for many years with the distinct purpose of meeting the arguments for municipal ownership. To avoid agitation it has refrained from going to Parliament for permission to increase its capital stock. Consequently it has distributed its large surplus profits in the form of reduced prices for gas and betterments to its plants. Most instructive of all is the attitude of the companies toward their employees. The Newcastle gas company has met this situation by a willing recognition of the gas workers' union and by a resort to arbitration through which wages have been materially raised. The South Metropolitan Company has developed its copartnership scheme so that every disaffected workman is silent or dismissed.

The influence of wage-earners through their unions upon the conditions of municipal employment in the United States has been complicated through the presence and activity of practical politicians.

The views expressed by Prof. Commons are in many respects favorable to municipal ownership. He finds, however, that the proper method of dealing with employees is the most difficult and critical problem of municipal ownership, and he favors recognition of organized labor as a safeguard against the pressure of outside (political) recommendations.

In the course of his report Professor Commons said:

"I take it that the key to the whole question of municipal or private ownership is the question of politics. The kinds of business that we are dealing with are essentially monopolies performing a public service, and are compelled to make use of the streets which are public property. If their owners are private companies they are compelled to get their franchises and all privileges of doing business from the municipal authorities. Consequently it is absurd to assume that private ownership is non-political. We do not escape politics by resorting to private ownership—we only get a different kind of practical politics."

In general, Professor Commons finds common labor better paid by municipalities in America than by private companies.

Mr. Sullivan sums up his observations with the conclusion that in all but the most poorly paid forms of labor, and for tramway employees, municipalization has not raised the wage or improved working conditions of the employes above conditions in the private undertakings.

"No street car undertaking in Great Britain has ever been a 'private' enterprise in the sense in which the word is applied in this country," says Mr. Sullivan. "The twenty-one years' term of the franchise, the veto of company petitions by village authorities, the enormous cost of Parliamentary powers and local assents, and various other restrictions non-existent in the United States, shackle and impoverish British tramway company management and consequently forbid an intelligent investigator to employ British example to illustrate possibilities in America through change from private to municipal ownership. British tramways have always been semi-municipal. As by the terms of their franchises all England tramway undertakings may be taken over by the municipalities, directors manage their properties with that end in view."

Both gentlemen agree that there is

no appreciable difference in wages in municipal and private gas and electricity undertakings.

A review of the reports of the expert engineers and accountants employed by the Commission was made by a committee of four Commissioners, and, their general conclusions follow in a few brief paragraphs, indicating the trend of their discussions.

Two of the writers, Walton Clark and Charles L. Edgar, criticise severely the municipal plants examined, while two other writers, Prof. Frank Parsons and Edward W. Bemis, find much to favor in municipal plants which were investigated.

"It is not public ownership, but private ownership," Professor Parsons says, "that is responsible for our periodic crises and the ruin of our industries. It is not impossible that the elimination of the public service corporation through public ownership is one of the things that would do more to help along the process of making our cities fit to manage business affairs." Mr. Bemis believes that the greatest reason for the strength of the municipal ownership movement lies in the relations of the public service corporations with the State and local governments, which relations he declares are destructive of political purity, democracy and free institutions. In this same connection Mr. Edgar and Mr. Clark take the view that the evil of building up political machines with city employes as a basis exists now to a degree in American municipalities and that the disastrous effects would be much greater if the many gas, electrical and street railway employes were added to the present number of city officeholders. Professor Parsons expresses the conviction that municipal ownership would develop a higher class of municipal administrators. He denies that public ownership would destroy individual initiative, and says that "a Gladstone or a Roosevelt can find as much room for individual initiative in the service of the people as the president of a street railway or lighting system can find in the service of his company."

Three American gas plants were examined by the investigating committee and experts. These were at Wheeling, where the plant is operated by the city, and Atlanta and Norfolk, where there is private ownership and operation. In addition the committee visited the Philadelphia gas works and the labor investigators visited the Richmond, Va., gas works.

In comparing the public and private gas service, Messrs. Edgar and Clark say:

"If we consider together the price the Wheeling consumer pays for gas and the character of the service rendered, we may not doubt that he gets less of net result per dollar expended than does the gas consumer in Atlanta or Norfolk. Our experts found nothing to praise in Wheeling's service and little to criticise in the service of the companies at Norfolk and Atlanta."

The labor situation at the plants examined is compared to the advantage of the private plants. The power of appointment at Wheeling did not rest with the superintendent, and therefore the employes did not have the fear of discharge by him in case they did not perform their work properly. At Norfolk and Atlanta the certainty of prompt discharge in case they did not satisfy their immediate superior in the operation of the plant acted to make the men work better and more efficiently than was the case at Wheeling."

The bad effects of the political conditions are set forth.

Four of the best known American municipal plants, those of Chicago, Detroit, South Norwalk, Conn., and Allegheny, Pa., were examined by the commission and experts. As to the cost of operation of these plants, the Chicago plant is cited to show that including items for depreciation, interest, taxes, proportion of salary, insurance and water, there is a loss to the city, based on simple interest on the amount paid, of $6.70 per lamp per year, or a total of $284,202 annually, compared with what the cost would be if service were taken from a private company. These figures are based on statements submitted by the commission's expert accountants and do not agree with the estimates of the city electric department, which show a saving to the city.

The characters of the plants investigated are shown at some length.

Water systems operated by the municipalities in Chicago, Cleveland and Syracuse and by private companies in Indianapolis and New Haven, were investigated. The physical characteristics of the plants are given in a general way.

Summarizing the results of the investigation as to the quality and purity of the water supplied, Messrs. Edgar and Clark say:

"This phase of the question may be summarized with the statement that while the natural conditions in the different cities call for different methods of treatment, it is evident that the two companies examined were more solicitous regarding the purity of the water supply, and adopted more thorough means for insuring the same than did the three municipalities who run their own water department.

Under the heading "Financial," an exhaustive review of the economic operations of municipal and private undertakings both in Great Britain and the United States is given by the reviewers, who find that it is admitted by the advocates of municipalization that the debts of British cities have been enormously increased by its operations.

"It is not worth while to discuss the effect on the finances of American cities of the municipal operations of the industries that we have investigated. Properly audited they have, with one or two exceptions, lost money, and their plants are all inadequate to good service and have, with the exception of the water plants, little more than a scrap value in view of the present state of the arts."

In favoring municipal ownership Professor Parsons declares that in most discussions of the subject too much attention is given to the purely financial side of the question. "Dollars and cents are not to be neglected," he says, "but life, liberty, justice, virtue and intelligence—the whole character product and social product of our institutions—are of greater moment than their money product." Taking up financial results, Professor Parsons

gives it as his view that the municipal plants are more economical. In the comparatively few cases where municipal systems do not make low charges the public still gets the benefits that under private operation go to the stockholders, for the profits of the public plants are used to improve the service, pay off the capital, relieve taxation or accomplish some other public purpose. Municipal plants are found as a rule to have a lower capitalization than private plants, both in relation to output and in relation to assets."

Discussing so-called failures of municipal ownership, Prof. Parsons claims that some of such cases are really failures of private ownership. "Take Philadelphia gas, for example, he says. "It does not appear that Philadelphia ever had real public ownership of the gas works. The councils were full of the agents and allies of the private street railway, telephone, gas and electric light interests and they purposely mismanaged the gas works, allowed them to be filled with supernumeraries and let them get out of repair by refusing year after year to appropriate, even out of the receipts of the plant itself, the money necessary to keep it in order, so that they might have an apparently good excuse for executing a lease of the works to themselves. Philadelphia did not have a real public ownership of gas, but one of the worst forms of private ownership—ownership by political grafters, in the pay of corporations but masquerading as public servants."

Mr. Bemis opens his detailed review of the experts' reports with an analysis of the charges for water, finding the rates to be more favorable to the consumer in the municipal plants. He compares rates and quality of water, claiming the advantage to be with the municipal plants, and also considers the political conditions with a strong leaning toward municipal ownership.

Richmond, Va., is cited by Mr. Bemis as a city where a municipal gas plant has not only reduced prices, but has also turned a profit into the city treasury. Mr. Bemis' review of the Philadelphia gas situation is in marked contrast to that of Messrs. Edgar and Clark. Both sides quote Dr. Rowe as authority and they reach very conflicting conclusions.

Wheeling, W. Va., is given by Mr. Bemis as an example of what may be accomplished by a municipality, even under unfavorable political conditions. Despite its admitted defects, he says, the Wheeling experiment has been a financial success, and has been "the pioneer throughout the United States in low charges."

That the municipal electric light undertaking at South Norwalk, Conn., is one of the most successful plants, either public or private, in the United States or Europe is the opinion expressed by Mr. Bemis. The operation of the Chicago plant, also, is commended, the expert quoted by Mr. Bemis estimating the profit to the city on the plant up to the close of 1905 at $710,433. The spoils system has been singularly kept out of the Chicago plant, according to Mr. Bemis, although the plant itself is not all that could be desired.

Mr. Bemis closes with a reference to and summing up of political and labor conditions, which he finds, generally speaking, more favorable under the municipal undertakings.

The operation of British street railways by municipalities and privately owned corporations respectively, is considered in great detail in two reviews by William J. Clark as an opponent of municipalization, and Prof. Frank Parsons as an advocate of public ownership and operation.

In his review Mr. Clark compares the tramways of Great Britain with the private enterprises of the United States, much to the advantage of the latter. He declares that the American traction systems under private ownership are far more progressive than those of England, Scotland and Ireland; that they give far better suburban service, that cars are less crowded and that lines are being extended with far greater rapidity. This he attributes to the absence of restrictions in the United States as compared with Great Britain. The difference of rate of fare in the two countries, Mr. Clark says, is more than offset by the greater number of free transfers given by the American systems. He says the private companies in the United Kingdom give a superior service as compared with the municipally operated lines.

Professor Parsons, on the other hand, expresses the opinion that municipal ownership of British tramway systems has been successful from every point of view. He sets forth that the municipalities were the first to show a progressive spirit in changing from horse cars to electric systems; that their lines have been well managed and that the hours of labor of employes were shortened, while in many instances wages were increased. He declares that the British plants must be measured by British and not American standards. Professor Parsons also notes that in England the payment of fare means that the passenger has a seat and not merely the right to transit.

Mr. Clark points out that no American street railroads were investigated by the commission and the only tramway installations directly investigated in Great Britain were those owned by the municipalities of Manchester, Liverpool, Glasgow and the London County Council and those owned by the following private companies: London United Tramways, Dublin United Tramways and the Norwich Electric Tramways. Mr. Clark enters into a statistical statement of the facilities enjoyed by the urban inhabitants of Great Britain as compared with the town and city population of the United States, claiming advantages in all respects under American private ownership conditions.

Mr. Clark compares governmental shares of profits from tramways in Great Britain and America to the disadvantage of the former. He takes up what he terms the inaccuracies of British municipal accounting, claiming direct loss from operation of tramways, or an actual deficit when sinking fund payments and reserve for depreciation are considered. The British municipalities omit from the capital account of their tramways large sums which should be charged thereto and cause these expenditures to be "unjustly carried into the general accounts of the cities."

A comparison of rates of wages per hour paid by British municipal traction

systems and by certain companies in New York state is made by Mr. Clark showing "that American street railways pay practically double the rate for salaries and wages that are paid in the United Kingdom."

The fact that the consent of the local authorities is required is used by the local authorities to force the companies to make excessive payments, and even when a franchise is obtained, it is for a brief term of years, scarcely long enough to warrant the heavy expenditures required for modern electric railway construction. Against this the municipalities at comparatively slight expense, obtain their Parliamentary rights to perpetual and monopolistic franchises. The local authorities have practically an absolute veto power as applied to company applications and this power prevents the extension and development of the tramway systems. The right of the municipalities to purchase the traction lines at the end of 21 years had resulted in Great Britain being very much behind other countries in the development of electric and other tramways.

Professor Parsons calls attention to the rapid progress in municipal operation of street railways in Great Britain, from 1894 to 1906. The marked success of municipalization in Leeds and Glasgow, he sets forth, gave the movement irresistible momentum, and in 1906 all the principal cities of the United Kingdom had municipal operation of their tramways except Dublin, Bristol, Norwich and Edinburgh. The principal reasons for the municipalization of British tramways, according to Professor Parsons, have been poor service by the companies; their ill-treatment of employees; their refusal to assent to the adoption of electric traction, extension to suburban districts, and other vital improvements; the constant difficulty experienced by the cities, amounting to practical impossibility of securing a reasonable regard to the public interest, or even the fulfillment of actual contracts; the growing belief on the part of the public that the streets and all monopoly uses of them are public property which should not be handed over to private parties, and the desire that the profits of the undertaking should inure to the benefit of the public.

Next to the wish to obtain a better service at lower fares, says Professor Parsons, the predominant motive in the municipalization of British tramways has been the desire to improve the condition of labor. The benefits to labor under city management at Glasgow are computed at $515,000. There has also been a rapid extension of the lines into Glasgow's suburbs, 50 miles being the total of new line during the period of city operation.

Transit charges are judged in British cities by the minimum fare, the average fare and the distance given for various fares, especially the average distance for a penny (2 cents) which, the Professor says, is the fare the mass of the people pay. A comparison of Dublin, private ownership, and Glasgow, public ownership, shows, that the Dublin charges, within the rates on which substantially all the traffic moves, are from 50 to 100 per cent. above the Glasgow rates for the same distance.

The service is good according to British standards and in some instances is excellent even according to American standards, says Professor Parsons. The speed of British cars is low as compared with American systems, but the speed limits are fixed by the Board of Trade.

In various respects the equipment of the municipal lines is superior to that of the companies.

The cars and plants of all the systems under consideration were found to be adequate, modern and efficient. Repairs are well kept up, the plants are clean and neat, the works are properly ventilated and complaints are properly attended to.

Analyzing the financial conditions of the public and private traction systems in Great Britain, Professor Parsons declares that the municipal system at Glasgow has about $4,000,000 more assets than liabilities, but that the London United, a private company, has $16,580,000 of capitalization and $5,820,000 of tangible assets. In addition to the payment of regular taxes, just as if they were private concerns, the four municipal plants—Glasgow, Manchester, Liverpool and London County Council—have paid nearly $4,000,000 in relief of general taxation. The benefits of the profits of the municipal systems are shared by 6,747,994 persons, while the profits of the private companies are divided between stockholders who number less than 8,000.

Discussing the political results of municipal ownership in Great Britain, Professor Parsons says:

"There has been an increase of political and social efficiency as well as of economic efficiency. The tramway owners, with the power of private monopoly in their hands, overruled the will of the people. The companies behave much better now. Not only has the fear of speedy municipalization in case they did not satisfy the new standards and the educated public sentiment developed by municipal operation made a strong impression on the remaining companies, but they have also been stimulated by municipal example to do their best to rival the advancement made by public management.

The reports of the experts upon munical operation of public utilities in Great Britain, have been reviewed by Milo R. Maltbie, Walton Clark and Charles L. Edgar. They are divided in opinion as to the success of the undertakings as a whole.

Mr. Maltbie says that municipal operation of public utilities in Great Britain has passed the experimental stage. He declares that the gas and electric plants operated by municipalities, generally give a superior service at a relatively lower cost, as compared with the privately owned companies. By far the most interesting part of Mr. Maltbie's conclusion, however, is that actual ownership and operation is not necessary. "It has been found in Great Britain that no system of control or regulation is complete without the power in the hands of the municipalities to purchase and operate," says Mr. Maltbie. "But the mere fact that it has the power often makes its exercise unnecessary, and what the Britisher desires is not the universal adoption of some method of producing results, but the

results themselves. In the analysis of the results of public and private management it should be borne in mind that such a comparison is not a comparison of municipal with private operation subject to no restraining force, but with private operation under systems of regulation which are claimed to be the best which have yet been devised in Great Britain and with private management that has been chastened and bettered by the fear of public condemnation, by the restraint of government regulation and the possibility of municipalization."

Messrs. Edgar and Clark favor some form of regulation of private companies rather than the adoption of the municipal ownership idea. They declare it to be plainly proven that municipal ownership is productive of many and serious ills with little or no compensating good. They hold that the solution of present difficulties is to be found, not in municipal ownership and operation of the public utilities, but in the election of municipal officers who will protect the governed against injustice on the part of individuals or corporations.

The gas plants examined by the Investigating Committee of the Commission were those conducted by the municipalities of Birmingham, Glasgow, Manchester and Leicester and by private companies at Sheffield, the Newcastle and Gateshead Company, and the South Metropolitan Company of London. On the important subject of maintenance of plants, etc., Mr. Maltbie says that during last year every municipality set aside out of earnings a larger total to maintain or extend the plant or wipe out indebtedness than did any private company. In operating expenses there is not much difference between the municipal and private plants, the differences in expenses being confined to interest, dividends and credit balance, and in these items he finds the municipalities superior. This condition he finds to be due to the higher rate of interest and profit, and the greater amount of liabilities of the private plants. The quality of the gas, itself, that is, its candle power, Mr. Maltbie finds to be superior in the municipal plants, according to the official reports. The municipal plants Mr. Maltbie found to be conducted with greater efficiency than the private undertakings. Discussing progress and the introduction of new inventions, Mr. Maltbie's view is that the municipal plants are as modern, as efficient, and as fully up-to-date as the company undertakings. He also gives it as his opinion that the encouragement given to the production of new inventions and the discovery of new processes by a probable demand for them, is certainly as great under municipal operation as under private management.

The electric lighting plants investigated by the Civic Federation Commission were the municipal ones at Manchester, Liverpool, Glasgow and the Borough of St. Pancras, London, and those operated by the Newcastle Supply Co., the Newcastle District Company and the four London companies: the City of London, Westminster, St. James and Central. Charges by the municipal plants were more economical, according to Mr. Maltbie. As to efficiency of service, there was no difference between the municipal and the company undertakings. Upon the whole, the municipal undertakings seem to be as modern as those belonging to the companies, but not so well located or arranged, and perhaps not quite as efficient.

In concluding his review of the reports of the experts Mr. Maltbie says: "The opponents of municipal activity have frequently tried to scare the British voter and to prejudice him against the operation of public utilities by citing the large increase in total indebtedness within the last fifty years, as compared with the decrease of the national debt. Over 40 per cent. of the local debt is for water, gas and electricity works, tramways, markets, harbor improvements, wharves, cemeteries, baths, workingmen's dwellings, etc. In every one of these cases the debt is represented by physical assets. It has been definitely shown not only that this debt is not a burden upon the taxpayer, but that the taxpayer gets a financial benefit from municipal operation, and therefore from the very debt which is claimed to be a burden upon him. tI is not evidence, but it is suggestive, that the local rates (tax rates) were lower for every group of towns when there was municipal operation of gas, electricity or trams than where companies were operating.

Mr. Edgar and Mr. Clark open their comments on the British gas situation by pointing out that the private companies supply gas at lower prices than do the municipalities. The service given the consumer by the private companies is declared to be superior to that given by the cities. Considering the general gas service, from a financial standpoint and with a view also to the character of service given and the maintenance of plants, Mr. Edgar and Mr. Clark declare in favor of the private companies.

"On a superficial view," say the reviewers, "the fact that municipal undertakings contribute some of their earnings to the city treasury, and thus aid in reducing the tax rate, seems an advantage gained by that method of operation." Leaving aside the question of injustice involved by a system of relieving the taxpayer at the expense of the gas consumer, they show that greater profit would have resulted by application of the lower rates of Newcastle to Birmingham, Manchester and Leicester.

The examination of the electric lighting systems of Great Britain shows, according to Mr. Edgar and Mr. Clark, that municipalities in England, though said to be much better governed than are those in the United States, are by no means as well adapted for commercial operation of an electric lighting plant as are private companies controlled by men of average honesty and ability whose training and initiative are given full scope. "It appears," they add, "that so far as the prices charged are concerned the system of municipal ownership and operation of electric undertakings in England has given its advocates no reason for feeling ashamed or elated, but that so far as extending the benefits of electric light and power and so far as progressiveness in developing the industry so as to give the best possible service are concerned, it has shown itself to be entirely outclassed by the system of private operation."

Messrs. Edgar and Clark in closing their review summarize their opinions as follows:

"We still believe that there are ills in the American body politic that may be remedied or cured. We believe that the remedy should be applied and the cure effected without any unnecessary departure from the American idea and the American system; and that it is not necessary, in the effort to cure the ills from which the body politic may be suffering, to destroy that body.

"We believe no intelligent reader of the voluminous record of this Commission's work wil fail to conclude that it clearly proves municipal ownership to be productive of many and serious ills, with little or no compensating good.

"The writers of these chapters, agreeing we believe with the other members of the Committee of Twenty-one, that public service companies should reasonably be regulated and afforded the protection that comes with regulation, and appreciating that the Committee was not appointed or constituted to consider methods of regulation, nevertheless desire to record their opinion, that some form of regulation of private companies should be adopted in each of the United States. As it has always been the function and duty of government to insure that individuals shall deal justly with their fellows, it is now the function and duty of government to protect the governed against injustice on the part of these associations of individuals working under the name of public service corporations. Any government that is too feeble or corrupt to control with justice the conduct of a public service corporation, has little prospect of being able itself to supply such public service with efficiency and justice. Our duty is to elect to office men who have the intelligence and integrity to govern efficiently, honestly and justly. Our duty is to conserve the human agencies that have made our country what is—the adventurous individual and voluntary association—but not to let them be our masters."

The reports referred to are printed in three volumes which are nearly ready for delivery. The first volume, about 500 pages, contains the general conclusions of the Commission, those on British municipalities being formulated by Frank J. Goodnow and those on American Municipalities by Walter L. Fisher. It also contains the full text of the reviews of the experts' reports and the labor investigation, brief abstracts of which are given above, and verbatim reports of conferences upon municipal trading held in London with several prominent authorities.

The second part of the report in two volumes, each of about 1,000 pages, contains the reports of the experts. The first volume of this second part is devoted to the United States and the second volume to Great Britain and Ireland. The experts on gas lighting and on electric lighting and power have a chapter each in each volume. There are special chapters in the first volume on the Philadelphia gas works, Chicago municipal electric lighting and on waterworks systems. There are special chapters in the second volume on tramways and on taxation of public utilities. Each of the chapters on gas lighting, electric light and power, water works and tramways contains reports from several experts on the plants examined.

These volumes can be obtained of E. A. Moffett, secertary of the Commission, 281 4th Avenue, New York City, the first volume for $2 and the other two volumes for $8 together.

MACHINES FOR DIGGING TRENCHES AND GRADING ROADS.

By Frank C. Perkins, Buffalo, N. Y.

Until recently the building of high grade roads and the digging of ditches have been carried on very largely by hand labor but modern road construction and trench excavation is now done very largely by the use of power machinery and labor saving devices. This not only expedites the work but reduces the cost of construction and the amount of hand labor to a minimum. Tile drainage is now used more extensively, as the expense of digging ditches has been greatly lowered by the use of traction ditchers, such as that shown in the accompanying illustration.

The actual cost of drainage of an 80-acre farm in Illinois is given in Elliott's "Practical Farm Drainage" as $11.40 per acre by old methods. Of this amount practically one-half was chargeable to labor digging the ditches in which the tiles are laid. For instance in laying 8,000 lineal feet of 4-inch tile at a depth of 3½ feet, the tile alone cost 2 cents per foot and the labor of digging the ditches cost another 2 cents per foot.

By the use of a modern labor saving device for this work, the small traction ditcher, two men can do the work of 15 to 20 skilled laborers, working with spades and shovels, and of 100 or more men, when the larger traction ditchers are employed.

It is a remarkable fact that by the use of this modern machinery 3 lineal feet of trench can be dug per minute in

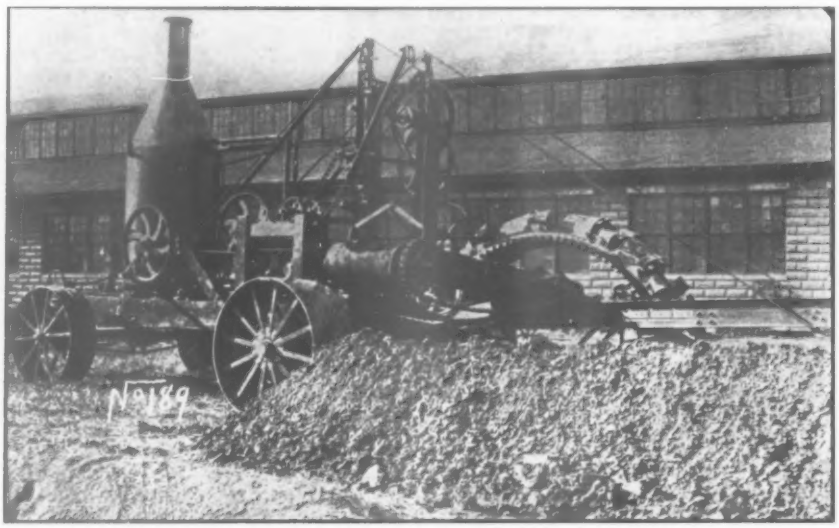
ordinary earth to a depth of 3 feet, and at this rate one machine would dig 1800 feet per hour.

The traction ditcher consists essentially of a traction engine on the rear end of which is mounted an excavating wheel provided with excavating buckets fastened to its circumference, as shown in the accompanying view. This excavating wheel is an open wheel, that is to say, it has no axle, but it revolves upon anti-friction wheels placed just outside the rim of the excavating wheels. The buckets have a top and back but no bottom. They are shaped somewhat like the bowl of a drag-scraper; and in fact they act very much like a drag-scraper in digging, for as the excavating wheel revolves each excavating bucket cuts off a slice of earth which fills the bucket. When the excavating bucket reaches the end of the arc near the top of the wheel, the dirt falls out of the bucket upon a belt conveyer.

The accompanying illustration, Fig. 1, shows a 24-inch contractor's traction ditcher cutting a depth of 3½ feet and is a left side view, the operator's platform being on the opposite side of the machine. It shows the construction of the machine and the working of the excavating wheel. The conveyor carries the dirt off outside of the trench where it piles up.

This trench excavator cuts the full depth of the trench at one cut and leaves the bottom exactly on the grade desired. The operator sights along the sight arm at targets on flag poles provided and operates a hand wheel that raises or lowers the excavating wheel until the sight arm is at the proper level. In this way the operator has perfect control over the depth to which the excavating wheel cuts and he can keep the bottom of the wheel within a fraction of an inch of the desired grade.

Another most interesting labor saving machine operated by horse power or a traction engine is the elevating grader, twelve horses being utilized, eight in front and four hitched to a push cart behind, when that form of power is employed.

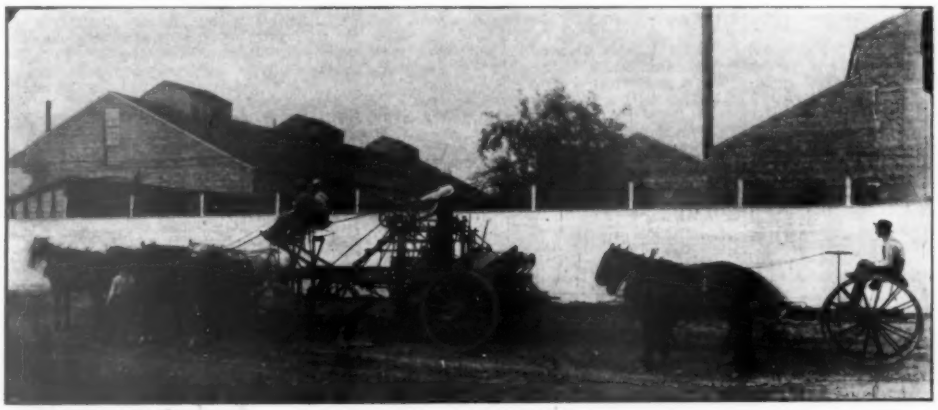


BUCKEYE TRACTION DITCHER ON SEWER TRENCH.

The elevating grader, ditcher and wagon loader, as shown in the accompanying illustration, Fig. 2, is a wonderful labor saving device and can be put to various uses, including the building of embankments, street and road building and the construction of railroads and electric traction lines.

The large amount of railroad building at present in progress in the United States as well as in Europe and the many thousands of miles of interurban electric traction lines being built each each year make the question of the possibility of an elevating grader being used of the highest importance to those concerned in the construction of such work. An elevating grader will load

500 to 600 1½ yard dump wagons in ten hours actual work. For making cuts and fills therefore this machine is exceedingly economical, particularly when the haul is in excess of 500 feet. It is maintained that the cost of building grades and of making cuts and fills can in many cases be cut in half by the builders using an elevated grader in place of the obsolete methods often employed.



ELEVATING ROAD GRADER.

It may be of interest to note some of the principles employed in a machine that can do such economical work. On the left hand side of the machine a plow is employed which throws the earth on to a belt a yard wide which carries it up an incline and deposits it either in embankment or into wagons. It will be noted that the principle is a very simple one, and there are a number of elevating graders now on the market.

One of the principal features of the elevating grader, shown in the accompanying illustration, is a direct plow draft. That is, the plow is drawn directly from the evener instead of motion being imparted to it directly or indirectly through the main frame of the machine. It is maintained that this naturally lightens the draft and at the same time avoids destructive strains detrimental to the life and durability of the machine.

CEMENT FILLER FOR BRICK PAVEMENTS.

In the specifications and directions for laying vitrified brick pavements, approved in general by the National Brick Manufacturers' Association and published and distributed by the National Paving Brick Manufacturers' Association the set prepared for the "best known construction" contains the following requirements regarding the filler for the brick with the accompanying remarks, in explanation and direction:

—The Filler.—

The filler shall be composed of one part each of clean sand and Portland cement. The sand should be dry. The mixture, not exceeding one-third bushel of the sand, together with a like amount of cement, shall be placed in the box and mixed dry, until the mass assumes an even and unbroken shade. Then water shall be added, forming a liquid mixture of the consistency of thin cream.

From the time the water is applied until the last drop is removed and floated into the joints of the brick pavement, the same must be kept in constant motion.

The mixture shall be removed from the box to the street surface with a scoop shovel, all the while being stirred in the box as the same is being thus emptied. The box for this purpose shall be 3½ to 4 feet long, 27 to 30 inches wide and 14 inches deep, resting on legs of different lengths, so that the mixture will readily flow to the lower corner of the box, which should be from 8 to 10 inches above the pavement. This mixture, from the moment it touches the brick, shall be thoroughly swept into the joints.

Two such boxes shall be provided in case the street is twenty feet or less in width, exceeding twenty feet in width, three boxes should be used.

The work of filling should thus be

carried forward in line until an advance of fifteen to twenty yards has been made, when the same force and appliances shall be turned back and cover the same space in like manner, except to make the proportions two-thirds Portland cement and one-third sand.

To avoid the possibility of the thickening at any point, there should be a man with a sprinkling can, the head perforated with small holes, sprinkling gently the surface ahead of the sweepers.

Within one-half to three-quarters of an hour after this last coat is applied and the grout between the joints has fuly subsided and the initial set is taking place, the whole surface must be slightly sprinkled and all surplus mixture left on the tops of the bricks swept into the joints, bringing them up flush and full.

It must also be mixed in small quantities, as it is next to impossible to keep the sand in suspension when more than a common water pail of each, sand and cement, is used, and unless it is deposited upon the pavement with the sand in combination with the solution you will get the cement and water in the lower portion of the joints between the bricks and the sand without the cement in the upper portion. If you could get the sand in the lower, and the cement in the upper portion of said joints, you would have a good grouted street. Some one, some day, may perfect a mechanical device for doing this satisfactorily, but at this time no such method is known. The rocking trough has been tried for the mixing and discharging, but invariably the cement will flow out first, then follows the sand to fill the upper parts of the joints; therefore, the safest way

SOUTH MAIN STREET, PARIS, ILL.
Six Years Old.

After the joints are thus filled flush with the top of the bricks and sufficient time for evaporation has taken place, so that the coating of sand will not absorb any moisture from the cement mixture, one-half inch of sand shall be spread over the whole surface, and in case the work is subjected to a hot summer sun, an occasional sprinkling, sufficient to dampen the sand, should be followed for two or three days.

—Extra Mention.—

Dry, sharp sand for this mixture is necessary without question or comment. The first application should be thin in order that it may flow to the depth of the joints of the bricks, thereby insuring a substantial bond, and should be kept in constant motion while being applied, otherwise the sand will settle and you will have water and cement instead of water, sand and cement. The water and cement wouldn't be objectionable, but the sand by itself is wholly so.

is to use the scoop shovel as the specifications direct.

Ten days is the minimum time for keeping the street blockaded and free from traffic. Thirty days would be better, and longer if it were possible. In testing laboratories the usual time for allowing cements (neat cements at that) to stand before applying the test, is twenty-seven days. Therefore when you open a grouted street to traffic in ten days you are demanding and expecting more from the cement than any testing laboratory would, so the streets should remain closed as long as a suffering public will permit.

It is urgently insisted that in no case shall the proportion of cement be lessened.

Grouting thus finished must remain absolutely free from disturbance or traffic of any kind for a period of at least ten days. These specifications, closely and skillfully followed, will give you the three important factors of a desirable city thoroughfare—durabil-

ity, comfort of travel, perfect satisfaction.

The foregoing are some of the many reasons why the above instructions for brick street building should be embodied in all specifications by the authorities.

This gives the process of applying the filler, but close attention is necessary to other parts of the specifications for laying a brick pavement according to the "best known construction" to procure perfect results. Perhaps the best way to show how perfect results can be and have been obtained will be to describe the development of the method above specified and the failures which have been important in pointing out the proper way.

FIFTH STREET, TERRE HAUTE, IND.
Fourteen Years Old.

The idea of the method was first suggested by the construction of a part of Wabash street in Terre Haute, Ind., eighteen years ago, and that this first street happened to have all the characteristics for a perfect result is shown by the fact that the portion of the street so constructed is still perfect in surface, where it has been undisturbed by the relaying of the street railway track, although this is the principal retail business traffic street of the city, and is subjected to continuous travel, concentrated somewhat by the street railway tracks into restricted bands of wheel wear.

The specifications for this street called for a broken stone base. For some reason the contractor desired to depart from the specifications and use stone dust instead of sand for filling the stone and he was permitted to do so under severe requirements for the process. The amount of dust put on was so great that heavy and long continued rolling was necessary to bring the surface of the base down to grade. A two-inch sand cushion was then put on. The specifications called for Murphy grout for the filler for the brick, but the contractor was permitted to use a Portland cement filler under close supervision as to method of application. The filler was put in substantially as described in the specification above and the joints were completely filled to the top. The filler still remains in the joints, the inequalities in the faces of the bricks have worn off, the surface as a whole has worn off evenly, and as a consequence the surface of this portion of the street is smooth and perfect, the cement in the joints serving to complete the surface and make it as one surface though made up of bricks. The remainder of the street, laid with the ordinary care and according to the ordinary specifications, is a good average street for its age, where it has been undisturbed.

A year or so later South Sixth street was laid under a thoroughly competent and careful city engineer, using the specification for filler developed on the Wabash street pavement. This street had a fresh sewer trench and was laid with a broken stone foundation, but most of it, after about seventeen years

wear, is perfect in surface and as smooth as a continuous pavement. The brick used was one which is rather brittle and chips easily, so that with ordinary workmanship and joints the edges would chip off and give the rounded surface of the bricks and cobble appearance of the street so common on the older brick streets. There were many chipped corners and pieces chipped out of edges by handling, but the cement filler closed these and remained in them and is still there, completing the continuous smooth surface.

Several new troubles were found in this street which have led to modifications in the specifications for laying the pavement, which may be described as follows:

No expansion joints were put in. As a consequence when the pavement expanded under the heat of the sun the arch rose and formed a hollow space under the brick surface which causes a rumbling sound when traffic passes over it. The soil on which the pavement was laid is light and the curb was narrow, consequently the pressure from the expanding brick moved the curb back slightly and quite uniformly, relieving the pressure so that the arch did not rise enough to break, except at the intersections. When the movement of the top of the curb was prevented by sidewalk, or other immovable surface, the bottom of the curb was pushed back and now stands at an angle with the vertical, showing the stress in the arch and showing very clearly the way in which it was relieved. There is no perceptible indication of expansion lengthwise of the street.

The intersections were laid with the four quarters on diagonal lines, after the best standard pattern. Expansion of these intersections was prevented, in several cases, by the sidewalks coming to the curbs, the catch basins and the rounded corners of the curbing, none of which were movable. At some of these intersections the expansion of the brick has been sufficient, with the greater length of arch diagonally across the intersection, to lift the brick high enough to break the bond and cause the pavement to give way, in at least one case by a sort of explosion. This demonstrates the necessity of an expansion cushion, which is provided for as follows in the specifications and instructions:

—Expansion Cushion.—

An expansion cushion must be provided for, one inch in thickness next to the curb, filled two-thirds of its depth with pitch, the top one-third being filled with sand.

—Extra Mention.—

This pitch joint next to and along the curb answers two purposes, it takes up the expansion of the brick and prevents a possible cracking of the pavement through and along the center of the street, which sometimes occurs if the ends of the courses of the brick are abutted directly against the curb which acts as a skewback or haunch to the arc of the pavement, which is often strong enough (especially if the sidewalk is up to and against the inside of the curb) to resist the force of expansion in that direction and it will find relief in raising the pavement and the cracking mentioned above may occur. And again, in taking up the expansion the brick are kept in contact with the sand cushion below, thereby preventing the rumbling noise so often heard, and occasioned wholly through lack of contact.

The inch of sand on the top of the pitch joint has a tendency to prevent the pitch from flowing, which it is likely to do in very hot weather. It is essential that the board occupying the place to be filled with pitch remain in place until after the street is in all other respects finished, but always withdrawn and the pitch applied within 36 hours after the application of the cement filler.

An interesting fact in this connection is the effect of the expansion on the joints of the brick pavement and on the bricks themselves when they are not free to rise and the expansion joint is lacking. It was observed where the "exploded" part of the intersections had been relaid a trifle below the surface of the portion which had not been disturbed, in an alley wing relaid below the former surface, and in the alley itself laid with a surface concave upward. Evidently the greater tendency of the top surface to expand, the heat on the surface being greater than below, had concentrated the stress on the upper edges of the bricks. As a consequence the edges had been crushed or chipped off and the bond of the cement in the joint had been broken, and, even where there was no traffic whatever the joints had the appearance of hard usage, giving further evidence of the necessity of an expansion joint.

That the expansion joint, properly put in, cures the rumbling and the chipping of the joints was shown by other streets of three to six years age having the expansion joints.

Those with most experience in the laying of cement filled streets believe that no expansion joints running across the street are necessary, the larger number of joints being able to take care of the stress, provided the joints are well made and the bond of cement with brick is good. This result can

BYRON STREET, MANKATO, MINN., BEFORE IMPROVEMENT.

be reached with proper care in applying the filler. The bricks must be thoroughly wet before the filler is applied, so that there will be no absorption of water from the cement mixture. The mixture must be applied in such manner as to keep the sand and cement together and give no opportunity for the water to float the cement out of the sand. The joints must be filled full. The sand covering put on the pavement after the filling is completed must be kept wet enough so that the filler will not dry out before the cement has thoroughly set. Some years before the adoption of the specifications quoted above, the writer after considerable experimenting hit upon a method which is almost exactly described in the specifications and the accompanying instructions and his evidence may be added to that of others that the method of the specifications if fully and carefully followed will give full and tight joints quite as durable under traffic as the best brick.

Common defects in the joints are caused by allowing the sand to separate from the cement and by allowing the water to be absorbed from the mixture or evaporated from it, which will cause weak joints, the mortar separating easily from the brick; and by failure to fill the joints completely, which will cause the edges of the brick to chip off under traffic and make a comparatively rough pavement until the brick are worn down to the level of the filling of the joints. One passing over a street can readily point out the places where such failures to follow specifications have been made.

It is evident that a brick pavement with perfect cement joints is as easy to clean as any other continuous pavement and it is as nearly waterproof. The best joints are made with regular brick or block laid close, but good joints can be and are made with repressed brick of any standard form of edge and side stamp, laid as close together as possible.

Uniformity in quality of the bricks in the street is desirable, soft brick tending to make the street surface uneven. But the rate of wear is more uniform with the perfect joints than when the individual bricks are subject to the attack of the traffic on the edges. Seven kinds of brick can be found in the Terre Haute streets laid with cement filler, and there is practically no difference in surface of those which were properly laid. This shows the value of the joint in equalizing the wear on the bricks themselves.

STREET IMPROVEMENT IN MANKATO, MINN.

The city of Mankato, Minn., had about 11,000 population in the census of 1900 and probably has more than 12,000 population at this time. The city has a civic pride which is constantly demanding better conditions of streets, both in construction and in care. Over $10,000 was assessed upon the property benefited for curbing and gutter in 1906 and $4,400 for cement sidewalks in addition to $4,200 for cement sidewalks put in by property owners at private contract. The city has laid over 26 miles of cement walks since 1901.

The construction of curb and gutter, lawn and sidewalk is described as follows by Mr. J. R. Thompson, who was city engineer from 1897 until this year:

For some years past we have been improving the streets by putting in a combined cement curb and gutter with a footing stone one foot wide along the outer side of the gutter.

Our standard curb was 14 inches high in back, 8 inches on face, 6 inches thick, with a gutter 18 inches wide and 6 inches thick. The bottom 4 inches of gutter is made of 4 parts sand to 1 part cement and the balance of work of 2½ parts sand to 1 part cement. After the work was finished with the trowel it was gone over with a wet brush, giving it a surface that would not show hair cracks.

The footing stone was of native limestone and was one foot wide by 8 inches thick and in lengths of 1 foot and upwards. The idea of the footing stone was to prevent wagons from running along the straight face of the gutter and spoiling it and principally to stop the water from following the face of gutter and undermining it. Many of the grades are quite steep and the water is often carried long distances on the surface of the street.

The average cost of combined curb and gutter has been 65 cents per running foot and 15 cents for the footing stone all in place.. Sand costs about 60 cents per yard delivered; cement men $4.00 per day, helpers $1.75 to $2. The prices obtained included a base of 4 inches of sand or gravel and all

BYRON STREET, MANKATO, MINN., AFTER IMPROVEMENT.

excavation where the street was on grade.

The city usually put the street back in shape after the curbing was in, except that the contractor was required to haul away stone chips, etc.

Most of the driveways were made 30 feet wide, and then given plenty of crown and finished off with gravel. About one-fourth of the principal portion of the town has been guttered in the past 6 years. The width of the roadways at the time of beginning of my duties as city engineer in 1897 was 52 feet regardless of whether the street was 66, 80 or 100 feet wide. In the face of some of the most violent opposition we induced the Council to cut it to 36 and 40 feet in places and 30 in one short street. After a lapse of 6 years we have nearly the whole sentiment in favor of a 30-foot street except in the very heart of the city, where it is 36 to 40 feet, and in many instances the old curbing is being set out and the roadway narrowed at the request of the property owners.

During the past six years practically the whole town has been supplied with substantial cement walks. That expense being out of the way the matter of curbing is being taken up and is petitioned for as eagerly as were the walks.

The whole cost of the curbing is assessed to property benefited. The charter, however, provides for a discount of 10 per cent. on all assessments paid within 30 days from date of city treasurer's notice that the same is due. Probably 98 per cent. of all assessments in 1906 were paid when due, so that with the 10 per cent. discount and the cost of putting the street back in shape, together with what has to be paid for city property's share, the city pays from 12 to 20 per cent. of nearly every improvement.

The accompanying photographs, for which we are indebted to Mr. Thompson, show the condition of a street before the improvement he describes is made and after, also an asphalt street in the center of the city. The great improvement made in the appearance of the street by reason of the widening and beautifying of the lawns and the definite lines of the curbs is well shown in the pictures. Such improvements cause the property owners to beautify their own property and thus more than double their effect in improving the appearance of the city.

CAUSES OF DECAY IN TIMBER.*

By C. W. Berry, Superintendent of Creosoting Works, Union Pacific Railroad.

It is now generally conceded that all decay, decomposition, disintegration or putrefaction of plant as well as animal tissue is brought about through the presence, growth and development of the minute micro-organisms generally known as bacteria and fungi. These are universally distributed, being found everywhere except in healthy living tissue. In the living plant they are ordinarily excluded so long as the bark or epidermal tissues remain unbroken. If wounds are made, accidentally or in the process of pruning, these become a source of danger to the plant (tree). Means of ingress for the germs of decomposition have been provided. If the tree be in a vigorous condition and the wound not excessively large, through the rapidity of its growth and the germicidal resistance of the living protoplasm it may be able to guard against invasion. The wound becomes calloused or the scar entirely overspread by a new coat of epidermis.

*A paper before the U. S. Wood Preserving Association.

On the other hand, if the tree be weak or the wound large, the powers of resistance are not sufficient to exclude the small but innumerable insidious foes. This being true of the living tree, it is more strikingly true of the dead tree, i. e., of the tree after it has been cut down in the forest. The timber (ties) or lumber that is made from it, being plant tissue, is of course subject to invasion to a much greater extent than before, since the protective covering is either removed or becomes itself subject to attack by the self same forces of disintegration. In the living state the epidermis and bark not only exclude germs mechanically but they produce antiseptic substances, such as tannin, resins, ethereal oil, etc., that are fatal to the germs.

Admitting then that wood is subject to decomposition through the action of micro-organisms, it is to be noted that these organisms require certain conditions for their development. Chief among these conditions are moisture and warmth.

When the living tree is first cut, the

BYRON STREET, MANKATO, MINN., AT FULTON STREET.

watery sap and the protoplasm in that part of the tree that is at that particular time alive, supply the moisture necessary for the growth and multiplication of the bacteria. If, however, the timbers or lumber be protected from outside moisture, the wood soon dries to such an extent that the multiplication of the germs ceases and the whole reaches a state of desiccation. Thoroughly dried lumber we know, of course, endures indefinitely.

Bacteria, like other plant organisms, require certain temperatures for their growth and development. At temperatures near to or below the freezing point, their activity ceases, but they are not necessarily destroyed. As the temperature rises above 100 degrees Fahrenheit their activity decreases until one kind after another is finally destroyed. In the spore condition, some are not destroyed even by boiling temperatures.

In subtropical and tropical regions, it often happens that optimum conditions both as to water and heat are attained, and it is in such places, as we have a right to expect, that the disintegration of exposed wood goes on at a maximum rate.

The chemical question involved in the process of decomposition is a complex one. It is included under the general term fermentation. All fermentation is due to the presence of enzymes or ferments. These enzymes are produced in two ways: (1) from or by living protoplasm of the cell in the plant or animal organism, i. e., the ferment is the result of the life processes; (2) by the effect produced on organic substances by the presence of ferment-producing bacteria. The first class of enzymes is known as unfigured ferments, and are well represented by the digestive ferments such as ptyalin in the saliva, pepsin in the gastric juice, trypsin in the pancreatic juice, the digestive fluids of the animal body. The second class of enzymes are represented by all those which produce decomposition and are familiarly known as bacteria and yeast. Alcoholic fermentation in wine and beer making, and the fermentation of dough due to the presence of the yeast plant are familiar examples. Enzymes are extremely important in the plant and animal economy, and have the remarkable property of being able to decompose other substances without themselves being split up. They all contain nitrogen, but how they arise is still a problem. It is to be supposed that they form a constituent of the protoplasm of the organism which produces the ferment.

The ferment having been produced by the organism, it begins its action upon the substances in which the germ is present. Animal and plant tissues are highly complex chemical compounds. The ferment tends all the while to reduce these complex compounds to similar ones. What these similar compounds turn out to be depends upon the substance being decomposed. In the decomposed wood, which consists largely of cellulose, lignin, suberin, oils and some carbohydrates, the number of by-products is probably smaller and but few of them are of a volatile nature. It is in a certain sense a process of oxidation, producing carbon-dioxide and water. If nitrogenous matter be present the fermentation is usually called putrefaction owing to the various gases, having disagreeable odors, which are generated. The ultimate analysis, however, of the fermentative process is the complete reduction of the fermenting body to a relatively few stable compounds. The ultimate analysis is often termed mineralization.

I might here state that there is no ingredient originally in the wood which would tend to promote decay. That is to say, wood is the most stable form of plant products.

Young succulent plant tissue, filled with protoplasm, is the form that invites invasion from the bacteria or decomposition. Wood in the living tree is nearly all dead. There is only a relatively small zone in the "sap-wood" next to the bark that is really alive. The rest of the tree inside is quite dead and is kept from decomposition through the decades or centuries merely by the fact that the unbroken bark and epidermis exclude the germs which cause decay, as already explained. In fact, in many woods there are secretions,—oils, resins and tannins which are germicidal and the wood tissue, lignin; cellulose, etc., is plant tissue in the most resistant form. The quality of lignin and the extent to which the cell wall is thickened determines largely, the extent to which different woods resist decay.

As to the effect of live steam at high temperatures on the natural constituents of wood, I might make some observations based on analogy.

We give as a reason for cooking vegetables that the heat tends to break down the cementing substance (technically known as the middle lamella), which holds the cells together. That this is true as regards the ordinary table vegetables there can be little doubt, but it is to be remembered that in that case we are dealing with thin cellulose walls, a between the thick-walled lignified cells of wood.

I should reason from analogy, however, that prolonged steam cooking, especially at high temperatures, would tend to soft-

FRONT STREET, MANKATO, MINN, AT JACKSON STREET.

en this middle lamella and ultimately might disintegrate the wood elements, or at least somewhat reduce the tenacity with which the wood elements hold together. However, I would not expect these effects to have any appreciable extent as a result of a single treatment which is not unnecessarily prolonged.

Now as to the advisability of using live steam in the process of timber preservation, I might make a few statements based on my observations after several years of practical work in the business.

As has been clearly shown in the results of experiments carried on by the government, the strength of timber is somewhat decreased by the application of even moderate temperatures of live steam, though the timber may be brought back to its normal moisture content; but, if by the use of live steam at moderate temperatures the lignified cell walls are softened sufficiently, as has been previously stated will be the case, to permit of a greater penetration of the preservative fluid than could possibly be obtained if the cell walls are not softened, then the advantage of having a thorough preventative against decay would more than over-balance the small decrease in the strength of timber due to the application of steam. Though the steam may decrease the strength of the material, it has its advantages, for, as I have stated above, the bacteria which may have entered the wood through any abrasion of the bark and epidermis will be destroyed when subjected to moderate temperatures. Unless these germs of decay are destroyed, they will carry on their destructive work within the outer coating of preserved wood.

In forests the practice of blazing trees for the purpose of a trail or any other purpose, unless the trees are to be cut that season, is detrimental, for the bacteria germs may enter, and in many cases decay shows on the surface, while in many other cases the outside may heal over, but the germs of decay are in the wood and carry on their destructive work, and it is not noticeable until the tree is felled.

BOOKS FOR ENGINEERS.

The list of books for Engineers begun in the April number of MUNICIPAL ENGINEERING is continued. Suggestions of additions, corrections and changes are invited from our readers for insertion in a supplementary list.

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C. D. McMillan, W. G. A Treatise on Electro-Metallurgy. Illustrated. Net, $3.00. Embracing the application of electrolysis to the plating, depositing, smelting and refining of various metals, and to the reproduction of printing surfaces and art work.

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D. Clarke, J. W. Hydraulic Rams; Principles; Construction. Illustrated. London. Net, $0.70.

D. Frizell, J. P. Water Power. $5.00. An outline of the development and application of the energy of flowing water.

C. D. Goodell, John. Water Works for Small Cities and Towns. Net. $2.00.

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C. D. Marks, G. C. Hydraulic Power in Engineering. Net, $$3.50. Suitable for non-technical men. A practical manual on the concentration and transmission of power by hydraulic machinery. With over two hundred diagrams and tables. Illustrated.

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D. Barnes, Howard T. Ice, Ice-Formation and Frazil. 200 pp., 40 illustrations. $3.00. Special reference to water power development.

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The Engineering Index. Vol. I. 1884-1871 out of print. Vol. II. 1892-1895. Vol. III. 1896-1900. Vol. IV. 1901-1905, $7.50. Published by the Engineering Magazine. Good for mechanical and electrical engineers; not of much value for civil engineers.

American Society of Civil Engineers, $6.00.

Technical Literature. $2.00 a year.

The Technical Index, a monthly, published by M. J. Fitzgerald, 51 rue de l' Aurore, Brussels, Belgium, ordinary edition, $2.50, card-indexing edition, $4 a year. Full descriptive list of articles in engineering magazines all over the world.

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C. D. Taylor, Frederick W., and Thompson, Sanford E. A Treatise on Concrete, Plain and Reinforced. Illustrated. $5.00. With chapters by R. Feret, Wm. B. Fuller and S. B. Newberry.

C. D. Thurston, Dr. R. H. The Materials of Engineering.

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EDITORIAL COMMENT

Pavements of the Future.

New Forms of City Government.

The Ownership and Operation of Public Utilities.

PAVEMENTS OF THE FUTURE.

The American Society of Civil Engineers has been trying to look into the future of the street paving question and has had the assistance of some of the experts on paving in its effort. At the Convention just held in the city of Mexico, Mr. P. W. Henry, who has long been connected with the asphalt paving industry under that pioneer in asphalt development, Mr. A. L. Barber, considered pavements as either mineral or vegetable in origin and classified the surfaces as either sheet or block. Cheapness and durability, noiselessness and ease of traction settle the problem for him in the first paragraph in favor of a pavement of mineral origin laid in an unbroken surface. Macadam and asphalt are the only pavements now existing which in his opinion answer both these requirements, bitulithic and bituminous macadam being granted standing room between the two classes.

Mr. Henry assumes that the pavement of the future will be composed of mineral particles of some durable stone, such as quartz, trap rock or granite, graded in size to produce a minimum of voids on the principle developed by Mr. Warren in the bitulithic pavement. Coarser materials from, say, 1 inch diameter down will be used on light traffic streets where there is little danger of crushing, and finer materials, i. e., sand, on heavy traffic streets. Portland cement, perhaps, and coal tar will be used for the cementing material in the coarser mixture, when any is used, and asphalt in the finer.

Mr. Henry grants that other paving materials will be used under conditions peculiarly adapted to them, but he believes that the great development of the future will be in macadam and asphalt as paving materials.

Mr. Geo. W. Tillson, who is now the Chief Engineer of Highways in the borough of Manhattan, and is the author of a book on "Street Paving and Paving Materials" also tries his hand on a prophecy of the future of the paving industry.

There was not a mile of today's standard pavements in existence thirty years ago and Mr. Tillson sketches the history of the various forms that have been developed, cobble stone, flat stone, stone wheel tracks, belgian block, granite block, asphalt, wood and brick. He claims that no existing pavement is perfect because it cannot at the same time be durable, easily cleaned, not slippery nor noisy. He also calls attention to the fact that lack of study of the situation and of care in laying cause failure in producing the best pavement possible for a particular street.

For the perfect pavement Mr. Tillson demands a firm and enduring foundation.

Stone blocks should be better dressed; granite blocks should be smaller; and with automobile trucks these two improvements will make a satisfactory pavement if joints are well filled with bituminous or similar mixture. Mr. Tillson confesses limited experience in brick pavements but suggests bedding the brick in a yielding substance similar to the filler, i. e., presumably some mixture with asphalt or tar, to prevent noise. Mr. Tillson does not agree with Mr. Henry, for he thinks asphalt and other bituminous pavements will not stand heavy traffic, but thinks Mr. Richardson's latest specification for asphalt pavements will make them more successful under heavy traffic. New kinds of wood must be found for wooden block pavements if they are to remain in use.

Mr. Tillson's summing up is therefore to the effect that future improvements in street paving are to be brought about by a different use of the materials in vogue rather than the adoption of an entirely new material, and that great improvement can be made by intelligent study of the needs of the different streets to be paved and consequent better combinations of materials and use of methods of construction better adapted to the particular conditions.

Neither writer considers the possibility of laying block pavements in such manner as to make them practically continuous, as described for brick pavements in an article elsewhere in this number of MUNICIPAL ENGINEERING.

and would be equally possible for well dressed small stone blocks; or as is apparently possible for asphalt block pavements properly made and laid; and is a daily experience with wooden blocks. Neither writer considers, except for the one mention noted above, the increasing use of the automobile and the possible consequent change in both materials and methods of construction.

The effect of the automobile upon pavements has been felt rather on country roads than on city streets, for any so-called permanent pavement in good condition is reasonably satisfactory for automobile travel, while the best country roads under the old conditions are soon torn to pieces by the peculiar action of automobile wheels. The makers of roads are now in a fever of experimentation with all kinds of materials and methods which promise cheap improvement to meet the new demands, but cheapness is, at this stage, the first condition and only very slowly can we be worked up to the point of paying what is necessary to produce a durable and economical pavement. When the proper pavement is found it will be more economical than the old roads, because more durable, although it will probably cost more than the present roads. It will probably cost less than the present "permanent" street pavements. So, with the development of the automobile for all uses of traffic, there will be a closer approach of city and country street and road pavements to the same standards of construction. This will doubtless accompany a corresponding distribution of population, reducing the crowding in the cities and distributing the population beyond present city limits.

Whether these changes in condition will result in choice of new paving materials or in the change of methods of use of the old materials it is not now possible to say. There is much promise in new methods of binding the coarser mixtures of hard stone for the lighter traffic and there is some suggestion of improvement in brick pavements by giving them a noise-preventing base. The other suggestions made by the writers of the papers are simply in emphasis of the present requirements of good specifications.

NEW FORMS OF CITY GOVERNMENT.

The Galveston plan of city government, established in 1901, is described in some detail by Mayor Landis in MUNICIPAL ENGINEERING, vol. xxxii, p. 255. The city was in bad condition after the great storm of 1900 and the old form of government by mayor and council selected from the wards of the city did not meet the demands of the situation. Competent and public spirited men could not be elected in sufficient numbers to conduct the business of the city properly. Appeal to the Legislature secured the passage of a charter vesting the government in a mayor and four commissioners, in whom are vested all the legislative and administrative forces of the city. They are all apparently equal in authority, each being in direct charge of one of the city departments and all passing upon the work and the demands of each. The strenuous nature of the situation in Galveston brought forward competent men for each of the five elective offices and they have been re-elected because their work was not yet done. It remains to be seen what will be the condition when the special conditions have passed and the ordinary demands of individuals for recognition and of politics shall again take their usual place in the conduct of the elections and the administration of the offices.

The State of Iowa, attracted by the early success of the Galveston plan has passed a law applying a similar plan to cities in that state of more than 25,000 population, adding to it the public removal of an obnoxious official by a process of electing a successor to whom he must give way, and also adding the initiative and referendum.

The principle of the Galveston and the Des Moines plans differ so much from the principles upon which our American forms of government, national, state and municipal, have been based, that some attention should be paid to the matter, and it is proposed to open a discussion upon the subject, if there is sufficient interest in and information about the new plans to incite one.

The first thing which strikes the observer is the combination of the legislative and administrative functions in a single body. The members of the governing commission are the heads of the administrative sections of the government and the body as a whole passes all ordinances, makes all appropriations, approves all expenditures. So long as the incumbents are honest and competent and capable of working together, this method may be successful, as it undoubtedly has been in Galveston, but all are elected on a general ticket, and in a city where a dishon-

est ring controls elections there is no check upon the officials elected. In a city where salaries are low and terms are short and public service is rewarded by complaints and objections, competent persons cannot always be found to fill the offices, and when they are not elected there is no way to control the mistakes which they may make. Differences in politics, or in opinions regarding methods may lead to contentions in the Commission which will greatly interfere with progress and may even stop all progress. There seems to be no way of remedying this difficulty.

The Des Moines plan attempts to remedy this by means of the provision for removal of obnoxious officials, but the process is so complex and the appeal is so likely to be put on political grounds that its practical application with good effect is very doubtful.

The division of responsibility among the five members of the Commission reduces accountability and the difficulty of removal of the derelict officer makes it practically impossible to reach the real source of the difficulty.

Other weak spots present themselves, but it is sufficient for the present to suggest a comparison with the system which has its best examples perhaps in the Indiana system of city government. Here the legislative and administrative functions are kept strictly separate and each holds check on the other. The administration is centered in the mayor, who can be and is held strictly responsible for the business of operating the municipality. Like the manager of a great corporation he has the appointment of all his subordinates, subject in a reasonable extent to the merit system among subordinates. If any department is not going well the mayor discovers it and the reason for it and remedies the difficulty. If he does not, he alone is called to account for the failure. He can spend only such money for city purposes as the council votes him on his recommendation and that of the controller, his appointee. He can make no improvements assessable upon property benefited which the property owners remonstrate against in proper form. In short, he is the business head of a business organization, carrying out the instructions of his board of directors, the council, and his stockholders, the people.

The Galveston and Des Moines plans take the administration too far from the people, put it into hands given too much arbitrary power, without sufficient, if any, check or control.

THE OWNERSHIP AND OPERATION OF PUBLIC UTILITIES.

The report of the Commission on Public Ownership and Operation of the National Civic Federation has been completed and abstracts of the reviews of the reports made by the Commission's experts, which have been written by members of the Commission, have been made public in advance of the issue of the volumes of the report. These reviews are quite voluminous, taking up a large part of a 500-page book and only the shortest abstract can be presented in an article intended to give a birdseye view of the whole procedure. This article appears elsewhere in this number of Municipal Engineering. A few remarks upon these reviews may not be out of place although a full discussion must be left until the volumes of the report itself can be considered.

At the time of the appointment of the Commission a doubt rose in the writer's mind as to the propriety of a bi-partisan commission such as had apparently been formed. A bi-partisan body, made up largely of prominent advocates of the opposite sides of a question is quite different from a non-partisan body, made up of students of principles and methods without bias or with only so much bias as their previous studies have given them, and without prejudices which could not be overcome by new evidence. When announcement is made that the experts selected for the examination of the plants chosen for study are expected to work to a certain extent in pairs, being chosen for their experience on one side or the other of the question, the bi-partisan character of the investigation is still further emphasized.

Nothing can be said of the reports of the experts at this time, since they are not yet read, but undoubtedly they are truthful and have only so much bias as has unconsciously been absorbed through their previous training.

The reviews of these reports, however, made, confessedly, by partisans on both sides of the question, are now open for discussion, with the reservation that the abstracts made public in advance of the issue of the volumes of the Commission's report may not represent the authors with the utmost accuracy.

The tone of these reviews is that of the open debate. Each writer selects the points which are most favorable for his own view, makes the comparisons which will most thoroughly support his theories or preconceived ideas.

This statement is made as of an observed fact and not with any intention of reflecting upon either side or upon the honesty of intention of any member of the Commission. The Commission has simply supplied a forum for the use of gentlemen of strong convictions, who are on opposite sides of a most important question and whose honest intention is to defend their positions in every legitimate way.

We all know the comparative futility of a debate conducted under such circumstances when the conditions are so variable and the mass of information is so vast and apparently so conflicting, because so largely non-comparable, and it is therefore so easy to select data which will support any position which may be taken. There is the same feeling about the discussion of the work of the Commission and the common criticism of the daily press is that we are not advanced in any appreciable degree by the two years of its activity. Editors, partisan on one side or the other, find matter to support their positions in one report or another and ignore or suppress the other side.

Of what real value is it for one side to compare rates under private and under municipal ownership in England to make its point, while the other side compares rates in England and the United States because this comparison is favorable to that side? The real condition is not affected nor is it indicated in the least by either comparison, and time spent in making them is worse than thrown away, because the comparisons are made in so partial and so partisan a manner that they befog the learner and disgust the advanced student. The reviews are full of such comparisons all the way from a direct and simple comparison of daily wages of employes without hint of the vast differences in other conditions, to the statement that the average American car carries 93,585 passengers while the average English car carries 182,463 passengers a year, as an evidence of greater crowding of cars in England; an utterly useless statement of an entirely irrelevant and incompetent fact, as could be shown by a dozen citations from among the vast complication of differences in conditions in the two countries, the simplest of which is the statement made by one of the reviewers on the other side to the effect that the payment of street car fare in England insures a seat.

There does not seem to be any very definite statement of agreement of the two sides upon the statement made by on reviewer that "politics" is not necessarily eliminated by a change from municipal to private ownership, nor by the reverse; nor upon that of another that the election of competent and honest officials is as necessary under one form of ownership as the other; but doubtless all agree fairly well upon these two propositions as they do upon that that private corporations should be regulated. If these three statements can be emphasized from the work of the Commission much good will have been done. There should also be much good material in the reports of the experts, if they are as non-partisan as the reputation of the men employed in the work implies. When we get these reports we can drawn our own conclusions.

Meantime, more really good material for use in making comparisons of municipal and private ownership results under conditions reasonably uniform and with reasonably good information about the amount of difference in conditions can be found in such reports as that of the Massachusetts Gas and Electric Light Commission than has been used in the reviews under consideration. But there is equal opportunity for partial selection and use of data by the partisan who is blind to everything but his own side of the case.

The fact is that, like the tariff in the opinion of a certain presidential candidate, the decision upon municipal or private ownership or municipal control is a local question, which each city must work out for itself for each of its public service industries with the aid from the State in which it is located to which it is fully entitled.

The municipality is a corporation formed for business purposes and should be operated on business principles. It is subject to the same defects of ignorance of stockholders (voters) and self-interest of officials as a private corporation and is a success or a failure in proportion as it is able or willing to avail itself of expert and honest service. Like all other corporations it should be subject to the control of the state, as it is, and should have the higher quality of technical direction which is available through state supervision. The same supervision should be given public and private corporations so far as they are servants of the public. It is apparent from the Commission's publications that the three propositions upon which all members of the Commission seem to agree, as stated above, are the important results of their work. If noth-

ing more has been accomplished than an emphasis of these propositions, which are by no means new, the work of the Commission will not have been in vain.

The effort of the future ought, logically, to be put, not on the promotion of municipal ownership or of private ownership of public service industries, but upon the securing of the most honest and economical administration of them. Whether this shall be under municipal or private ownership is, as stated, a local question, granted the state control of both classes of corporations which all agree upon.

The principles of the Massachusetts Gas and Electric Light Commission, of the public utilities laws of New York and Wisconsin, of the foundation of the Consumers' Gas Trust Company of Indianapolis as improved in the new Citizens' Gas Company are those whose application promises the greatest advance. Work along these lines will bring results, and the question of whether the actual ownership of the material plant which performs the service shall be in the public corporation or in a private corporation will settle itself. It is of secondary importance in any event.

A summary of the general report of the whole committee was made public after the article on a previous page was printed and since the above was put in type. The underlying principles of their conclusions are practically the same as those stated above. They are as follows:

Public utilities, whether in public or private hands, are best conducted under a system of legalized and regulated monopoly.

Public utilities in which the sanitary motive largely enters should be operated by the public.

The success of municipal operation of public utilities depends upon the existence in the city of a high capacity for municipal government.

Franchise grants to private corporations should be terminable after a fixed period and meanwhile subject to purchase at a fair value.

Municipalities should have the power to enter the field of municipal ownership upon popular vote under reasonable regulation.

Private companies operating public utilities should be subject to public regulation and examination under a system of uniform records and accounts and of full publicity.

On the general broad subject of municipalization, the committee reports that the general expediency of either private or public ownership is a question that must be determined by each municipality in the light of local conditions. "What may be possible in one locality may not be in another. In some cities the companies may so serve the public as to create no dissatisfaction, and nothing might be gained by experimenting with municipal ownership. Again, the government of one city may be good and capable of taking charge of these public utilities, while in another it may be the reverse. In either case the people must remember that it requires a large class of able men as city officials to look after these matters. They must also remember that municipal ownership will create a large class of employes who may have more or less political influence."

Exceptions to some of these conclusions are entered by Charles L. Edgar and William J. Clark and they must therefore not be considered as assenting to them all.

THE QUESTION DEPARTMENT

HOW TO LAY PIPE FROM RESERVOIR.

We are having a discussion in regard to the laying of a flow line from reservoir to city, a distance of 6,000 feet. It is my contention that the pipe should start with the large or flange end at the reservoir, and discharge from the small end. My opponent, however, claims that it should be just the reverse. I do not remember of ever having seen a green farm hand put down drain tile with the small end for an intake. What is your opinion, also what is the general practice of the best engineers in the country, and further is it "as correct one way as another?" It is a gravity line, a gradual descent from receiving end to outflow.

O. H. H., Perry, Okla.

The pipe is the same size throughout so that, so far as the flow of water in the pipe itself is concerned, there should be no difference whether the flange end is laid up stream or downstream. Some engineers think that the joint is a little smoother when the

flange end is up-stream, but practically there is little if any difference on this account. When the pipe is laid on the level the process of pouring the lead is equally easy whichever end is up-stream. But it is practically always the case that there is a perceptible fall to the pipe and it is easier to pour the lead and the joint is more completely filled if the flange end is the upper end. If the pipe line is laid on a uniform grade line this would put all the flanges up-stream. But if the line runs up and down over hills and under valleys, if the flange is always laid at the upper end of the pipe length, part of the line would be laid with flanges up-stream and part down-stream.

It would not be so convenient to begin laying pipe with the flange end next to the fill over pipe already laid. In tamping the lead into place the tendency in driving against the weight of the one pipe, when the spigot end is forward, is to loosen the joint, whereas, when the lead is tamped into the flange of the pipe already laid there is no tendency to loosen the joint which is being made and what little effect there may be on the last joint laid is to make it closer.

These are some of the reasons why the flange end is almost always laid forward during the process of laying pipe and why the pipe laying ordinarily begins at the lower point in the trench and proceeds up the grade, so that in such a case as that described in the question the flange ends of the pipe would be toward the reservoir. This is done, however, without reference to the direction of flow of the water.

If the pipe line is of vitrified clay the grade will practically all of it be sloping down from the reservoir end and it will have no pressure on it except possibly for short distances where slight and short depressions are crossed. The same considerations of convenience in laying will govern here and the flange ends will be up-stream.

NATURAL GAS DISTRIBUTION.

Where natural gas is to be found in inexhaustible quantities, what equipment would be necessary for utilizing same for lighting and heating purposes for a town having population of from 6,000 to 10,000?

What is the approximate cost of installing such equipment, exclusive of the cost of supply pipes and mains?

What sized main would be necessary for conveying the gas from the wells to the town, a distance say of twelve miles, and would the distance make any difference in the size of the pipe?

I want the data to cover such a plant as would be necessary for furnishing sufficient quantities of gas for fuel purposes for residences and for factories, the fuel bills for which amount to $2,500 or $3,000 per month based on oil as fuel at $1.25 per barrel, for the factories, exclusive of domestic consumption.

H. L. H., ——— Texas.

These are questions which cannot be answered in a general way, but should be referred to an engineer who can work up the information necessary to give satisfactory answers to the questions asked. If the wells are under high pressure, separators for removing oil and water from the gas, blow off cocks, pressure regulators, are the principal appliances necessary. Possibly facilities for drainage may also be necessary in the distribution system. As the pressure in the wells diminishes new wells must be driven and connected up, and ultimately, pumping stations may be necessary.

The influence of pressure, quality of gas, size of pipe, distribution of regulation, etc., are so great that a general answer to the question of cost would be of little value.

The loss of pressure allowable in transmission, the pressure expected to be maintained at the delivery end of the supply main and the allowance for present consumption and growth determine the size of pipe. This size would be less for domestic purposes in Texas than in Indiana. The supply to present factories can be determined very definitely, and if the factories are numerous or if large provision is made for prospective factories these will determine the size of pipe. Tables for determining flow of air and gas in pipe lines are given in mechanical engineering and gas engineering handbooks and pocket books, Suplee's "Mechanical Engineers' Reference Book" ($5) and Kent's Pocketbook, for example. The loss in pressure in a pipe varies with the length of the pipe and the square of the velocity and area of cross section and inversely with the fifth power of the diameter. In the same pipe it will be twice as much in a pipe 12 miles long as in one 6 miles long. The three variables, allowable loss in pressure, velocity and diameter of pipe must be fixed to fit the local conditions. "Compressed Air" computes that a 6-inch pipe 35 miles long and under 100 pounds pressure at the inlet will deliver 1,299 cubic feet of free gas per minute with a pressure of 30 pounds at the other end.

The engineers listed in the "Business Directory" printed in each number of

MUNICIPAL ENGINEERING, under the heading "Gas Engineers," are able to find the answers to the questions asked, and so are many of those listed under the heading "Civil Engineers."

JOURNAL OF ASSOCIATION OF ENGINEERING SOCIETIES.

Please give me address of the publishers of the Journal of the Association of Engineering Societies. It is not given in their advertisement.

A. E. W., Cleveland, O.

Fred Brooks, the secretary of the Board of Managers, is the publisher of the Journal, at 31 Milk street, Boston, Mass.

PROCEDURE IN CANCELLING CONTRACT.

Will you kindly inform me through MUNICIPAL ENGINEERING concerning the usual course of procedure taken by a city or other corporation in case the work being done by a contractor is unsatisfactory and not in accordance with the specifications and contracting party considers it desirable to take the contract from present contractor and relet same (such action being provided for in contract). What is the length of time that such a process should take?

SUBSCRIBER,
North Scituate, Mass.

This is a question which cannot be answered without full knowledge of the character of the work, the specifications and the terms of the contract. It should be referred to a local attorney who can make himself familiar with these points and who knows the Massachusetts laws and their methods of application in such cases.

Presumably the contractor has bondsmen and they as well as he must be notified of the breach of contract and the purpose to annul it. The bondsmen may or may not have the right to take up the contract and complete it. Probably they have. In case they do not have this right or do not exercise it within a reasonable time or the time fixed by the contract or the statute, the city may declare the contract forfeited and may then complete the work itself or advertise and let it to another contractor for completion. The city will have the right of action against the first contractor and his bondsmen for damages for the failure to complete the contract, for the extra cost, if any, of completing the contract, for the delay, and any other legitimate sources of damage. If the city owes the first contractor anything on account it can be retained to meet these claims, putting the business of bringing suit to determine the legal rights upon the first contractor.

These are the common contract provisions and the usual procedures, but they may be greatly changed by the terms of the contract and the local statutes and customs. Sometimes the city is able to complete the contract for less than the original contract price, in which case the first contractor has an opportunity to claim the saving as belonging to him. Whether it does belong to him or not is only to be determined for the particular case and not by any general rule.

The time necessary to complete the process can not be estimated in advance.

WHO CAN PROVE THE EARTH IS FLAT?

We need civil engineers that know enough to prove that the earth is level—straight—horizontal.

We need such men to construct, to build roads to and fro in America—to prove that water at rest is straight on its surface.

AURIN F. HILL, Architect,
Boston, Mass.

The writer in his experience has found so many proofs that the earth is not flat that he cannot answer the above requirement and it is referred to our readers. Our correspondent is secretary of the "American Press Writers' Association" so that he may perhaps be able to publish generally any proofs which he may receive. He also contends that the earth "stands fast" and asks for proofs of this statement also.

NAMES OF ENGINEERS AND CONTRACTORS IN MISSOURI.

Can you give me the names and addresses of any consulting engineering firm, firm of contractors or city engineer of southwest Missouri, in such towns as Springfield, Joplin or Carthage?

W. D. H., Madison, Wis.

Lists of names of engineers and contractors in these and other cities in Missouri and throughout the United States will be found in the "Directory of American Cement Industries" ($5). The lists are more particularly of persons using cement, but it therefore includes all the principal engineers and contractors engaged in construction work. City engineers are so designated in the lists of engineers.

APPRAISAL OF CEMENT PROPERTY.

I enclose you reports by the Henry S. Spackman Engineering Co., of Philadelphia, and the Lehigh Testing Laboratory of Allentown, Pa., in regard to tests made by them on cement materials furnished by me, which I think shows conclusively that I have ma-

terial which will manufacture a fine grade of Portland cement, and I also enclose copy of a report from Mr. Eckart, the chemist of the Hawaii Planters Experimental Station in regard to a material submitted to him for lime tests, and on account of these reports I would like to ascertain through you the name or names of appraisers of lime and cement properties. The land controlled by me is 300 acres in extent and from surveys made shows almost an inexhaustible supply of these materials. The land is about 1,400 feet from the main line of the Oahu Railway and Land Co. and about 30 miles by railroad to the city of Honolulu. The importation of lime into the Territory of Hawaii amounts approximately to 120,000 or 150,000 barrels per annum, and cement approximates 100,000 barrels. The prices paid here for lime and cement have been very uniform until the last year when considerable of an advance took place. The average market price for lime is $1.50 to $1.60 per barrel, and cement $2.75 to $3.00 per barrel. The price of oil as a fuel is $1.00 per barrel; 3 barrels to the ton is computed as compared with coal.

From the above general information, could you ascertain for me approximately what such a property would be worth? Perhaps you could give me the addresses of persons or firms in this line of business.

I would also ask you to obtain for me or put me in possession of the addresses of those who could give the cost of a modern cement plant erected complete, with a capacity of 500 barrels per day. Of course, I appreciate that the costs as computed there would not apply here, but for my purpose I could add what in my judgment would be the necessary percentage to give me a basis for making estimates.

Mr. C. F. Eckart's analysis of coral samples taken from the land shows a high percentage of silica in sample No. 2, and I would ask if it were possible to make a natural cement from material of this kind. I have been advised that this material would make a natural cement.

W. H. H., Honolulu, H. I.

The reports from the chemists were probably made on samples taken from the same gross sample. They certainly agree very closely in results and the general conclusion seems to be that the material will be able to produce good Portland cement. One important feature is not shown in these reports and that is the uniformity of the materials. This could only be determined by taking numerous samples from different parts of the deposits and analyzing them. The uniformity of materials is one of the most important questions, because if they are not fairly uniform it will be either impossible to make a uniform cement or will be difficult and expensive.

The firms named would be able to help in determining the value of the lime and cement properties, and make estimates of the cost of building a cement plant in this country and in other countries. Help can also be obtained from the persons and firms named in the "Business Directory," printed in each number of MUNICIPAL ENGINEERING under the headings, "Chemists, Cement," "Cement Plant Designers" and "Cement Machinery."

Comparison of the analysis of the coral sample No. 2 with an analysis of natural cement rock in this country indicates that the material will make reasonably good natural cement. This statement cannot be made definite without tests of cement actually made from the material. The analysis of sample No. 2 does not differ very materially from those of Louisville cement rock, not nearly as much as Louisville and Mankato cement rocks differ, for example.

This information regarding chemical analysis of cements is taken from the third edition of the "Directory of American Cement Industries" ($5).

WHITE CEMENT.

I have been greatly interested in your paper on "Commercial Value of Artistic Concrete." After referring to some of the old Spanish light cements you mentioned "a cement all but white in color * * * yields a color of about the same quality as that of the most sought for light building stone." Could you give me the trade name of this cement, the manufacturers' address or any information that will put me on the track of this particular cement?

ARCHITECT, Los Angeles, Cal.

The above letter was written to Mr. Louis H. Gibson, the author of the series of articles on concrete in construction which has been appearing in MUNICIPAL ENGINEERING. The cement to which Mr. Gibson referred is the Art Portland Cement Company's Parthenon brand. This is a true Portland cement which is very nearly white in color and does not have the cement color of the ordinary Portland cement, which is objectionable for most artistic work. It is manufactured at Kimmell, Ind.

NEW CEMENT COMPANIES.

The activity among the promoters of cement plants is so great at this time that a number of additions are made this month to the list of new cement companies printed on page 26 of the July number.

Berkshire White Portland Cement Co., organized with I. S. Kearney, Augusta, Me., as president.

Bronson Portland Cement Co., Portland, Me., organized with Wm. H. Jordan, Boston, Mass., as president and treasurer.

Continental Portland Cement Co., David M. Marks, St. Louis, Mo., president. Works proposed three miles south of St. Louis.

Erie Portland Cement Co., Toronto, Ont., incorporated by D. A. Forrester and others.

German Portland Cement Co., Chanute, Kan., plant proposed by W. A. Burks, Bentonville, Ark., and others.

Idaho Portland Cement Co., Lewiston, Ida. Plant proposed on Upper Snake river.

Inter-Mountain Cement and Brick Co., John C. Sharp, Pres., Salt Lake City, Utah. Plant proposed at Idaho Falls, Ida.

National Cement Co., organized with C. L. Murphy, Plainfield, N. J., as president.

National Portland Cement Co., 413 Mutual Savings Bank Bldg., San Francisco, Cal., proposes a plant near San Jose.

, Occidental Portland Cement Co., incorporated by H. O. Coughland and others at Jersey City, N. J.

Panama Portland Cement and Development Co., C. C. Godfrey, Batavia, N. Y., secretary. Works proposed on Tombigbee river in Alabama.

Portland Cement Co., Custer City, Okla., incorporated by Christian Gautentier and others.

Rusk Iron Co., New Birmingham, Tex., proposes plant at Rusk, Tex. W. H. Oatley, Gen. Mgr., Rusk, Tex.

St. Stephens Cement and Land Co., A. S. W. Lyons, Pres., Mobile, Ala. Plant proposed near St. Stephens, Ala.

Spokane Portland Cement Co., Spokane, Wash., incorporated by N. M. Kuppenberg and others of Spokane.

Standard Portland Cement Co., Sandusky, O. Proposed plant at Castalia, O.

Van Dorn Portland Cement and Coal Co., organized with J. L. Means, Shreveport, as president. Works proposed at Van Dorn, Ala.

Wahsatch Portland Cement Co., incorporated at Jersey City, N. J., by Salt Lake City, Utah, persons.

PRODUCTION OF CEMENT IN 1906.

Please give the production of cement in the United States, classified according to States?

NORTHWESTERN STATES PORTLAND CEMENT CO.

Minneapolis, Minn.

Following is the desired information in tabular form, taken from the latest estimates of the U. S. Geological Survey, the classification by States being made for each of Portland and natural cements. The second column gives the number of barrels of cement manufactured and the last column the value. When there is but one plant in a state it is combined with those in other states in the report that the plants may remain incognito. Slag cement is not classified by states, but practically all of it is made in Pennsylvania, Ohio, Alabama and Illinois.

Cement ..barrels.	51,000,445	$55,302,277
Portland cement barrels:		
Alabama, Georgia, Virginia, West Virginia	1,172,041	1,432,023
California	1,310,435	2,110,294
Colorado, Utah, Texas, South Dakota and Arizona	1,146,396	2,034,382
Illinois	1,858,403	2,461,494
Indiana	3,951,836	4,964,855
Kansas	3,020,862	3,908,708
Michigan	3,747,525	4,814,965
Missouri and Kentucky ..	3,350,000	3,260,000
New Jersey ...	4,423,648	4,445,364
New York	2,414,362	2,725,744
Ohio	1,422,901	1,709,918
Pennsylvania .	18,645,015	18,598,439
	46,463,424	$52,446,186
Natural cement, barrels:		
Georgia	180,500	$98,075
Illinois	365,843	118,221
Indiana	600,000	240,000
Kansas & Texas	238,311	129,781
Kentucky, Ohio and Virginia.	170,194	95,539
Maryland	63,350	32,675
New York	1,515,866	1,055,875
Pennsylvania ..	744,403	560,534
Wisconsin, N'th Dakota and Minnesota ...	177,330	92,560
	4,055,797	$2,423,170
Puzzolan or slag cement, barrels	481,224	$412,921

MAKERS OF NON-STAINING CEMENTS.

Will you be kind enough to send me a list of names of manufacturers of non-staining cements. I do not seem to be able to find same in your directory.

W. T. C., Jacksonville, Fla.

There is no separate list of non-staining cements in the "Directory of American Cement Industries" ($5), but an examination of the list of cement brands will show that the following cements are termed non-staining in that list: Blanc brand, manufactured by the Blanc Stainless Cement Co., Allentown, Pa.; Lafarge brand, imported from France by the Non-Staining Cement Co., New York City; Meier's brand, imported by C. E. McBride, 151 Third st., Louisville, Ky. Reference to the Art Portland Cement Co., in the list of "American Cement Manufacturers" and to its advertisement on the page following will give information

about this non-staining cement, which is a true Portland cement, and is thus distinguished from the others named. The information about these four cements is in the "Directory" and they are all the non-staining cements now on the market.

CAPACITY OF TUBE MILL.

What is the capacity of a tube mill in a sand-lime brick plant?

SUBSCRIBER.

This question is very indefinite, but the following information taken from a paper on the grinding machinery of a sand-lime brick plant, by J. W. Fuller, and the discussion of the paper by the National Association of Sand-Lime Brick Manufacturers, will give some light on the subject:

The use of the grinding machinery is to reduce the sand to proper size for the best results. The tube-mill requires preliminary reduction of the sand to size to pass a No. 20 screen. In one plant a 16-foot tube mill had an average output for 6 months of 1,400 pounds of such sand per hour fine enough for 90 per cent. to pass a 100-mesh sieve. The mixture of sand and lime in the tube mill was said to pack so as to reduce the output. Another member stated that one tube-mill would grind the material for 20,000 bricks a day; another that his was ample for 16,000 bricks a day, or 80,000 pounds a day of the mixture of sand and lime. The size and the hardness of the sand make material differences in the rate at which a mill can be run to produce the necessary fineness, and the size of the mill makes a great difference in the output. These figures take no account of these and other variations, such as efficiency of dryer, and so they are almost as indefinite as the question, but they seem to be the present limit of the knowledge of the subject by sand-lime brick manufacturers and will serve to give a general idea of what the tube-mill can do. Several speakers in the discussion referred to mentioned the necessity of determining the capacity of a tube-mill in a given plant by actual trial with the materials to be used.

NAMES OF MASONS USING CEMENT.

Can you tell me where I can find a list of masons and small contractors using cement?

H., ———, O.

The "Directory of American Cement Industries" ($5) contains the most complete list published of contractors using cement. The list in the last edition contains over 17,000 names. These contractors are of all grades so far as amount of business is concerned, from the largest general contractors to those who are practically masons working on their own account. The credit ratings given for most of these contractors indicate their standing and the class of small contractors can very easily be selected. The writer knows of no list of mason employes. Hendricks' "Commercial Register" ($10) contains a list of contractors and builders from which the masons can be selected, in the larger cities being still further classified as brick, stone and plaster workers and builders.

SOUTHERN CALIFORNIA CEMENT CO.

Can you tell me anything about the location of the Southern California Cement Co.?

SUBSCRIBER, New York City.

The Southern California Cement Co. is said to be controlled by Wm. G. Henshaw, of Oakland, Cal. The incorporators seems to be J. L. Rose, Geo. W. Reed, R. W. Church, Cecil T. Walker, Percy C. Black and B. H. Griffins. C. L. Carman is reported to be the engineer, and Architect John C. Austin, of Los Angeles, prepared the plans for the office building, which includes a hotel. The plant is under construction at Crestmore, about 3 1-2 miles northwest of Riverside, Cal., and contracts for machinery and supplies have been made. Crestmore is not yet listed in the U. S. Postal Guide and the company may be addressed at Riverside, Cal.

PREVENTION OF HAIR CRACKING ON CEMENT SURFACES.

Please let us know what method to pursue to prevent hair cracking in a pure cement finish.

P. L. CHERRY CO., INC.,
Portland, Ore.

This subject has been considered frequently in MUNICIPAL ENGINEERING. The most complete article on the subject is in vol. xxx, p. 8, and is by Albert Moyer. He attributes the hair cracks to the contraction of the neat cement and of rich cement mortar in hardening in air. His remedy is to keep the surface protected from drying out and sufficiently wet to make an equivalent of hardening under water, when he claims the hair cracks will not appear. Block makers and others who have tried curing concrete in water, state, however, that they have had trouble from hair cracking after some months, even when the blocks are

hardened under water. Possibly they have not been left in the water long enough. Some makers of cast stone by the wet process, using wet concrete poured into sand molds, have made complaint of hair cracking, although the specified conditions of this method of manufacture of concrete meet Mr. Moyer's requirements. However, these manufacturers may not have followed the specifications strictly.

The only method of preventing hair cracking absolutely is to remove from the surface the neat cement which works to the surface when water is used freely or the concrete is tamped until the water is forced out, conditions which are necessary for making the best concrete. Mr. Moyer suggests methods of removing the thin cement skin, and other methods are described in articles appearing in MUNICIPAL ENGINEERING, vol. xxxii, pp. 24, 25, 177, 179, 181. One of these articles suggests washing the partly set surface with a stiff wire brush, tooling, or adding a splatter-dash coat, using float finish rather than trowel finish for kinds of work to which such finish is applicable. Another, after mentioning the above and bush-hammering as methods of removing the skin of cement, describes the acid treatment, which is applicable at any time and to any form of surface, but not to concrete containing limestone. A third paper goes into detail regarding the methods of scrubbing and dressing mentioned above, and suggests the method of rubbing with a hard grinding surface, such as a hard brick with wet sand, or a block of corundum. Good surfaces can be made by any of these methods if experts are employed for the work.

The answer to the question reduces then to the statement that a neat cement surface can probably not be rendered perfectly safe against haircracking, although thorough damp curing may attain the desired result, and that certain prevention of hair cracking can only be obtained by removing the neat cement from the surface by persons expert in the methods used.

FORMULA FOR RUNOFF FROM DRAINAGE AREA.

What in your opinion is the best ormula for calculating the quantity of runoff for a certain drainage area. The writer has tried several without very much satisfaction.

X., ———, N. C.

This subject is well discussed in an article by Charles E. Gregory in MUNICIPAL ENGINEERING, vol. xxix, p. 162. McMath's modification of the Burkli-Ziegler formula, and a formula developed by Mr. Gregory using Professor Talbot's Formula for the curve of intensity of rainfall as a basis are the formulae there stated. The development of McMath's formula was shown in a paper in the Transactions of the American Society of Civil Engineers, April, 1887. Mr. Rudolph Hering, in a report on a single sewer district in New York City, modified the constants in the formula somewhat, but has since used the McMath formula in several reports upon plans for sewer systems.

Mr. Gregory's formula fits two cases cited in the article remarkably well, and it is probable that for similar conditions as to surface of watershed it would give equally good results for the run-off. The Burkli-Ziegler formula is quite general in its application and the modificaton of the constants by McMath has fitted it to the conditions in the United States, more particularly in the regions where the rainfall lies between, say 25 and 55 inches per annum, and it is perhaps more frequently used than any other. The difficulty in application is in the assumption of the values for maximum intensity of rainfall, slope of watershed and imperviousness of surface. With sufficient experience in these assumptions the engineer can get good results from the formula. The writer has found the formula ample in every case arising in his experience although he has always had a tendency to assign the lowest values possible for these quantities.

It is impossible to produce a formula for general application which eliminates the necessity for the exercise of judgment in the assumption of values of the variable quantities. The McMath formula, with proper exercise of trained judgment in this direction gives the most satisfactory results, in the writer's opinion, but, for conditions in a larger city, Gregory's formula would probably be still more accurate.

NAMES OF ROAD SUPERVISORS.

Can you give a list of the road supervisors in the United States?

E. P. C., Philadelphia, Pa.

There is no list of road supervisors, such as that desired. It would be very large, if obtainable. Thus the State of Indiana probably has nearly 5000 such officials. The State Highway Commissioner of Michigan, at Lansing, and the

State Highway Commissioner of Pennsylvania, at Harrisburg, are the only State officials publishing lists of township commissioners or supervisors and there are also district supervisors under their direction.

Following are the county and district authorities in each state having charge of the roads and more or less control over the appointment and duties of the local road supervisors. The only way to get complete lists is to write to the authorities in the various counties and towns for them.

Alabama—County Commissioners.
Arizona—County Board of Supervisors (3 members).
Arkansas—County Judge.
California—Board of Supervisors.
Colorado—Board of County Commissioners.
Connecticut—Board of Selectmen of each town.
Delaware—Road Commissioners of respective hundreds.
District of Col.—Engineer Commissioner.
Florida—Board of County Commissioners.
Georgia—County Board of Roads and Revenues.
Idaho—Board of County Commissioners.
Illinois—Commissioners of Highways of respective townships.
Indiana—Board of County Commissioners.
Iowa—County Board of Supervisors.
Kansas — County Commissioners. Township Trustees.
Kentucky—County Road Supervisors.
Louisiana—Police Juries of the various parishes (counties).
Maine—Board of Selectmen of each town.
Maryland—County Commissioners of each county.
Massachusetts—Board of Selectmen of each town.
Michigan—Highway Commissioners of each township.
Minnesota—Board of Supervisors of the various towns. County Commissioners of each county.
Mississippi—County Board of Supervisors.
Missouri—County Courts.
Montana—County Road Supervisors.
Nebraska—County Commissioners.
Nevada—County Commissioners.
New Hampshire—Board of Selectmen of each town.
New Jersey—Boards of Chosen Freeholders of counties. Chairmen of town or township committees.
New Mexico—Board of County Commissioners.
New York—Township Highway Commissioners.
North Carolina—Board of County Commissioners.
North Dakota—County Auditor.
Ohio—County Commissioners. Township Trustees.
Oklahoma—County Commissioners.
Oregon — County Commissioners' Court.
Pennsylvania—Township Supervisors.
Rhode Island—Board of Selectmen of various towns.
South Dakota—Board of County Commissioners.
Tennessee—County Courts.
Texas — County Commissioners' Courts.
Utah—Board of County Commissioners.
Vermont—Selectmen of various towns.
Virginia—Board of County Supervisors.
Washington—Board of County Commissioners.
West Virginia—County Court.
Wisconsin—County Court. Township Supervisors.
Wyoming—Board of County Commissioners.

City and town streets are usually under control of the city and town authorities and the names of those in actual charge can be obtained from the city mayors or town presidents.

Some of the dealers in special lists of names have partial lists of road supervisors. For example, Boyd has a list of 3,000, evidently a very small list in proportion to the total number. The writer has no information as to the accuracy of these lists.

ENGLISH MACHINES FOR APPLYING TAR TO ROADS.

In your editorial note in the July number of MUNICIPAL ENGINEERING in regard to dustless roads in England you refer to treatment of roads by Aitken's pneumatic tar sprayer; the Lassailly machine for applying hot tar; the "tarmaciser," which cleans the road and applies hot tar; the "tarspra" machines of various sizes: the "Thwaite anti-dust apparatus, using hot tar."

Can you give us information in regard to the addresses of the parties who make or handle them?

N. C. T., Boston, Mass.

The addresses desired are as follows: Thos. Aitken, County Buildings, Cupar, Fife, England; Emulsifix, Ltd., 55 Cross st., Manchester, Eng.; Robert Johnston & Co., 45 Parliament St.,

London, S. W., Eng.; Tarmaciser, Ltd., 7 Victoria St., London, S. W., Eng.!; Tarspra, Ltd., 20 Victoria St., London, S. W., Eng. Thwaite and Thorp, 29 Great George St., Westminster, London, S. W., Eng.

ELECTROLYSIS IN REINFORCED CONCRETE.

Is there any information in print as to the action of electricity on re-inforced concrete construction, such as sewers, etc.?

S. J. ROSAMOND,
Ft. Smith, Ark.

There is nothing definite in print regarding electrolysis of the steel in reinforced concrete sewers, conduits, or buildings. There has been an occasional question, especially in regard to buildings, but there have been no observations of any action by electricity in decomposition of the steel. Electrolysis takes place, theoretically, wherever there is a current which must leave the steel and pass to a poorer conductor and some moisture is probably necessary for the accompanying chemical action. In a sewer there is no attempt to make continuous connection between the bars of steel of the reinforcement, and these passages of electricity from one bar through the poor conductor to the next bar would be frequent. It is very doubtful whether a current of sufficient strength to produce serious effects could be induced to follow the steel in the sewer, certainly not if there were a water or gas pipe near. Concrete itself is a very poor conductor of electricity and the steel bars are presumably completely covered with a thin coating of cement which protects them from the action of moisture absorbed by the concrete. Even if there were electrolytic action on the steel it would not be dangerous in amount. The action on a pipe is to produce a weak spot or hole through which water or gas in the pipe can find its way. The action on the rod in the concrete would be simply to reduce its length or its diameter a small fraction of an inch a year over a small spot. This action would, under the worst conditions, be so slow that it would not materially weaken the sewer within several generations.

The liability of danger is so slight that direct experiments have not been deemed worth while, and the action is so slow and the use of reinforced concrete in such constructions is so recent that there has not been any opportunity as yet for observation of actual occurrences in practice.

COMPARATIVE VALUE OF SHALE AND CLAY PAVING BRICK.

Can you give me or put me in the way of geting any standard tests showing which is the better for paving, a shale or a clay brick? Can I get a record of the government tests on this?

J. N. G., Wellsville, O.

This question was answered in vol. xxxii, p. 96. Reference was made to the following articles in MUNICIPAL ENGINEERING, which contain tests of brick, vol. xxx, pp. 227 and 427; vol. xxviii, pp. 217 and 238; vol. xxv, p. 156; vol. xxii, pp. 284 and 363; vol. xxi, p. 17; vol. xvii, pp. 215 and 375; vol. xiv, p. 298; vol. xi, p. 326; vol. x, p. 393; vol. ix, p. 43; vol. viii, pp. 172 and 200; vol. vii, p. 283; vol. vi, p. 230; vol. v, p. 19, etc.

Some idea can be obtained by comparing these results of the value of various kinds of brick. It is not probable that any pronounced difference between the two classes of brick named will be found. Good clay bricks are better than some shale bricks and good shale bricks are better than some clay bricks. The selection must be made of the best individual brick rather than of the class of brick.

The writer is not acquainted with official government tests which will be of much help in making a decision on the question asked.

DESTRUCTION OF FIRE HOSE BY CHEMICALS ON WAGON.

The chairman of the Bridge and Street Committee of the City Council of Lake Forest, Ill., Mr. C. C. Pratt, gives the following description of the effect of carelessness in storing on a hose wagon chemicals for use in chemical fire extinguishers, which will interest our readers and perhaps prevent a similar occurrence somewhere else:

Our volunteer fire department were called out to fight a fire at one of the University buildings. You can imagine their humiliation when, after a quick run and a quick couple up and the water turned on, the hose began bursting at intervals of twenty to thirty feet. This bursting was to such an extent that there was no pressure at the nozzle and thus made their work useless until more hose was brought from the City Hall, which was a mile distant. Upon investigation it was found that the trouble was caused by the leaking of acid from bottles which were stored under the seat of the hose wagon. This acid was for use in the chemical extinguishers and was in bottles holding about one-half pint.

The bottles were corked and sealed with wax and were lying on their sides. The acid in one bottle had eaten through the cork and wax and dripped down on the hose, which was folded up in the bottom of the wagon. Wherever the acid dropped on the hose there was a weak spot caused by the effect on the cotton jacketing, also upon the rubber tube. The moral from this experience is to always place such bottles of acid right end up, and keep them where leakage or breakage will not endanger valuable equipment.

WATER SUPPLY

Filtratton and Water Waste—Lake Forest Water Supply—Philadelphia Filtration—Water Supply Contract—Horse and Automobile Fire Apparatus—Fire Liability of Water Company—Boiler Scale.

Results of Filtration Experiments and Water Waste in Washington.

A special report regarding the condition of the Potomac water in various parts of the system at different times during the last fiscal year, has been submitted to Gen. Mackenzie, chief of engineers, by Major Cosby, the engineer officer in charge of the Washington aqueduct. From tables in the report it appears that the turbidity of the water applied to the filters exceeded 50 on sixty-four days during the year, and it exceeded 100 on only ten days. The report says:

Series of observations on the appearance of filtered water having different degrees of turbidity indicated that when viewed in a clear tumbler or carafe against a dark background a turbidity of 1 destroys the brilliancy of the water. In an ordinary drinking glass a turbidity of 2 is noticeable, and one of 6 is decidedly objectionable.

The record of daily observations shows that the turbidity of the filtered water was 1 or more for 49 per cent, 2 or more for 19 per cent, and 6 or more for 12 per cent of the year. While it is true that the small amount of turbidity in the city water does not affect its quality from a sanitary standpoint, it is also true that just as long as it exists brilliant-looking spring or well waters will be used by some people in preference to the city supply.

These waters may be safe or otherwise. Their purity can not, however, be judged from their appearance. A protest from the inhabitants of the vicinity is made practically every time a public well is closed, even though its insanitary and dangerous condition may have been established beyond a reasonable doubt. As long as the filtered water continues to show periods of turbidity it will be difficult to establish public confidence in it.

An experimental filtration plant has been built and operated since February 7, 1907, for the purpose of ascertaining the best practicable method of clarifying the water. The operations show that as yet we have failed to find any system of simple filtration which promises to give satisfactory results. Neither double nor triple filtration removes the exceedingly fine particles of clay which remain after the first filtration. The most practical method so far found appears to be the use of a coagulant for a part of the time, and the experimental work indicates that by that means the water supplied to the consumer may be made as clear and sparkling as spring water. The cost of coagulation can not be definitely estimated from the data now at hand, and it is believed advisable to wait for the result of a full year's tests before making any recomendations on this subject.

The experimental filtration plant at the Dalecarlia or receiving reservoir comprises thre systems of filtration, as follows: System A, consisting of a rapid and a slow sand filter; system B, consisting of a Maignen scrubber and a slow sand filter; system C, consisting of a settling or coagulating basin and a slow sand filter.

Up to the present time no combination of filters has been found which has satisfactorily clarified the Potomac water. While the preliminary filters remove the greater part of the suspended matter and leave comparatively very little work for the slow sand filters to do, the grains of mud remaining in the water after the first filtration are so exceedingly small that they are not entirely removed by either a second or third filtration. In order to arrest these fine grains a layer of very finely powdered animal charcoal was applied to the surface of the slow sand filter system B, but without any apparent succes. The results from system C (the modified slow sand system) show, however, that it has so far been successful in keeping the water free at all times of turbidity by the occasional use of a coagulant and subsequent filtration.

The experience thus far gained with this system indicates that it will be found to be the most practical method of clarifying the Potomac water at a reasonable cost, and at the same time utilizing the plant already installed.

The bulk of the mud is not only removed by coagulation, but the small amount which remains is so changed in character that it can readily be removed by filtration. It also tends to form a sticky gelatinous mass on the top of the filter sand which assists in arresting particles of mud in the applied water for several days after the use of the coagulant has ceased.

In his annual report, submitted to Gen. Mackenzie July 11, Major Cosby devotes considerable space to the consideration of the best means of preventing excessive consumption and waste of water. A table is given which shows that with a population, according to the police census, of 329,591, the average daily per capita consumption of water in the District of Columbia during the last fiscal year was 203 gallons, and that the maximum daily consumption was 80,290,000 gallons, February 16, 1907. He says:

The average daily consumption and waste during the last year was 66,900,000 gallons. The slight diminution in the total and the per capita consumption of water for the fiscal year 1907, as compared with the previous fiscal year should probably be attributed to the systematic crusade against waste conducted by the District of Columbia water department. It may also, to some extent, have been due to the better quality of water supplied. During the hot portion of the summer the daily consumption showed a high average, with slight fluctuations. During the winter fluctuation of 25 per cent. in forty-eight hours took place, and the maximum daily consumption occurred during a spell of cold weather. In the cool spring months the fluctuations were slight and the average consumption was the lowest for the year.

In the annual report for 1906 it was stated that taking into consideration the fluctuations which experience shows will occur, 65,000,000 gallons per day is the greatest annual average quantity of water that the system can be safely counted upon to supply. The average for the past year was slightly above that figure. It is only reasonable to expect that weather conditions similar to those existing during January and February, 1905, will recur and result, as then, in an abnormally great use of water.

During February, 1905, the average consumption and waste for thirteen consecutive days was greater than what Mr. Hazen considered to be "the extreme capacity of the system which can be reached for a short time." Mr. Hazen's figures took into consideration the new factors introduced by the filtration plant, which was not in operation during February, 1905. Since his computations were made new condensers have been installed in the discharges to the main pumps at the filtration plant, and that has to some extent increased their capacity. The probable number of days during which an output of 95,000,000 gallons per day could be maintained has been increased.

The maximum daily output is limited by the capacity of the conduit and has not been increased.

Attention is again invited to this serious condition, and three possible remedies are suggested below:

First. Reduce the present constant waste. It is believed that a per capita supply of 120 gallons per day is more than ample for the present needs of the city. In cities, the data for which are at hand, 90 per cent of the services are metered, and the average per capita consumption is 64 gallons per day.

In only one case is the per capita consumption above 100 gallons per day. It is believed that by universal metering and charging for water according to the quantity used the daily consumption and waste in the District of Columbia can be reduced to 120 gallons per capita, or a total of about 40,000,000 gallons per day, with the present population, and that the cost to the average consumer would be less than under the present wasteful conditions. Only 11 per cent of the services are now metered, though this will be increased to about 20 per cent by the end of the fiscal year 1908.

Second. Obtain a new and independent supply. The arguments in favor of this course are set forth in the annual report of the chief of engineers for 1905. Such a work will require time and money. It should be preceded by a thorough and careful investigation of all possible sources and routes of supply. An investigation at this time will be of value whether the work is undertaken at once or not. To make the necessary preliminary investigations and surveys an estimate of $10,000 is again submitted.

Third. Install one or more booster pumps along the line of the Washington aqueduct to increase the flow while maintaining the supply in the reservoirs. This method should be considered only as an expedient to tide over an emergency. It would not materially increase the extreme capacity of the system, but would make it possible to deliver the full 95,000,000 gallons per day for an indefinite time.

In the past estimates have been submitted to cover only actual maintenance expenses and improvements. When a break or other contingency occurred necessitating any unlooked-for expenditure, it was necessary to stop ordinary operations so as to cover the extraordinary expense. Should, however, a serious break occur during the last part of the fiscal year the funds available might be inadequate and a disastrous condition result.

An appropriation of $5,000 is recommended to constitute an emergency fund, to be used only in case of a serious break, requiring immediate repair, in one of the important aqueduct or filtration plant structures, such as a dam, conduit, tunnel, bridge, building or important piece of machinery, all expenditures from this appropriation to be reported in detail to Congress.

Lake Forest Water Supply Troubles.

The Lake Forest Water Company has decided to stop furnishing water to the city of Lake Forest, Illinois, on August 10. The decision of the company comes after several years of hard fighting in the courts, and in the city council of Lake Forest. The water company formerly had a representative in the city

council, but since the administration of Mayor D. H. Jackson the company has lost its power. The council decided, a few weeks ago, that the rate of $40 for each 500 feet of street mains was too much, and reduced the amount to $25. George H. Holt, the president of the water company, says this was done without notification to the company, and it will quit business before it will accede to the demands of council. Members of council state that it is possible that a municipal water plant may be acquired, should the emergency arise.

Progress on Philadelphia Filtration Plant.

Another portion of the great filtration plant at Torresdale was put in operation at Philadelphia, Pa., July 5. Thirty-four of the sixty-five large filter beds have been completed and are in shape to receive water, while the sand for the remaining beds is being distributed in them at the rate of nearly 125 carloads a week. The conduit at Lardner's Point is in readiness for turning on the water, and as soon as the pure water reaches there a portion of the supply from the river at that point will be cut off and the filtered water forced through the mains to Frankford and other sections to be decided upon later.

How to Obtain a Water Supply Contract.

At a hearing in police court, at Lockport, N. Y., July 19, in the investigation of the alleged bribery of city officials in connection with the $600,000 water supply proposition, T. A. Gillespie, of Gillespie & Co., of New York City, testified that he gave $10,000 to the so-called Lockport Contracting Company to get the $340,000 contract for the pipe line from Niagara River. The contracting company submitted the lowest bid on the work, but in some manner secured a release from its bid from the aldermen, whereupon the Gillespie company got the contract. The hearing will be resumed July 30.

Comparative Cost of Horse and Automobile Fire Apparatus.

Consul General Jay White, stationed at Hanover, Germany, studied the cost of operating automobile fire engines. He says Hanover was the first city to purchase a complete automobile fire engine service, consisting of engines, hose carts and hook and ladder kit. The system is past the experimental stage, as most of the apparatus has been in service now for a period of five years. Consul General White secured a table showing a cost comparison of horses and automobile fire service, as follows:

	Horse.	Auto.
First cost	$11,050	$13,090
Maintenance first year	8,720	5,950
End of first year	19,750	19,050
Maintenance, next five years	43,500	29,800
Total	$63,250	$48,850

Liability of Water Company for Fire Damage on Account of Its Negligence.

The Supreme Court of Florida held, in the case of Mugge vs. Tampa Waterworks Company, that a taxpayer whose property is destroyed by fire on account of the negligence of a waterworks company in not furnishing water in accordance with its contract with the city, is entitled to recover damages from the company in an action of tort, where the company, by virtue of its contract, enjoys exclusive franchises and privileges and the proceeds of special taxes imposed for its benefit.

Loss of Heat Through Boiler Scale.

The Engineering Experiment Station of the University of Illinois has just issued Bulletin No. 11, "The Effect of Scale on the Transmission of Heat through Locomotive Boiler Tubes" by Edward C. Schmidt, M. E. and John M. Snodgrass, B. S. The experiments comprise tests on single tubes as well as tests of the entire locomotive boiler. The results of all the tests, plotted with reference to scale thickness, show great divergence in the heat loss, which is ascribed to differences in scale structure. The bulletin is of interest to all who have to do with the operation of steam boilers in localities where pure feed water is not available. The conclusions derived from the tests are summarized as follows:

1. That for scale of thickness up to ⅛ inch, the heat loss may vary in individual cases from insignificant amounts to as much as 10 or 12 per cent.

2. That the heat loss does increase with thickness in an undetermined ratio.

3. That mechanical structure of the scale is of as much or more importance than thickness in producing this loss.

4. That chemical composition, except in so far as it effects the structure of the scale, has no direct influence on heat transmission.

STREETS AND ROADS

Joliet Street Contract—Grade Crossings—Cincinnati Block Paving—Indiana Roads—Knoxville Improvements—Interurban Road Damage to Property—Patented Pavements in Louisiana.

Re-Assessment on Joliet Street Contract Ordered.

A decision was rendered by Judge Cowing, of the county court, at Joliet, Illinois, July 8, in which he overruled the objections made by the property owners to the paving of Morgan street. He directed, however, that an assessment be respread, charging the city 15 per cent. of the cost of improvement, and furthermore that any property benefited by the improvement and not included in the assessment be assessed.

The property owners made objection to the improvement of Morgan street on several different points in the ordinance. It was alleged that an itemized bill of the cost of the improvement was not made by the city engineer; that the C. & J. street railway had not been assessed in accordance with the city ordinance; that the method of assessment was irregular. Judge Cowing held that the ordinance went sufficiently into detail in the matter of expense, and cited rulings whereby, according to the city ordinances, the railroad company might be assessed for improvements in their right of way and the city do the work, or that the railroads might do the work under the direction of the city. Regarding the spreading of assessment, he ruled that the matter would have to be determined by the commission, but directed that a reassessment be spread whereby the assessment on the city be raised from 6 per cent. to 15 per cent.

Cincinnati Wood Block Paving Contract Valid.

In a recent decision rendered by Judge O'Connell, at Cincinnati, Ohio, he held that the contract for paving Mitchell avenue, from Spring Grove avenue to Carthage pike, is valid. It was alleged that there was a conspiracy and fraud between county officials and the United States Wood Preserving Company, claiming that all other wood block concerns were kept from bidding by certain provisions of the specifications. Judge O'Connell said that he could find no trace of conspiracy, collusion or fraud. The case will be appealed.

Grand Rapids Proposes to Abolish Grade Crossings.

Plans for the elimination of dangerous crossings in Grand Rapids, Michigan, will be prepared by L. W. Anderson, city engineer of that city, who, with E. H. Christ, commissioner of the board of public works, visited Rochester, N. Y., recently, to study the problem of abolishing grade crossings.

Public Road Improvement in Indiana.

The statement was made in MUNICIPAL ENGINEERING two or three years ago that Indiana has mode good roads from the practical standpoint of excellence of service than any other state. At one time an argument was made from this in support of the district and county system of building roads, with only incidental dependence on the state or the national government for such special work as they care to do on through routes, or for special purposes. The economy of the cheaper roads during the development period of the country was also shown, the increase in value of farm property with the increase in case of getting to market being very marked.

Recent figures emphasize the superiority of Indiana in mileage of good usable roads for all seasons of the year. Thus at the end of 1905 among the states giving state aid to road building, Maryland had 23 miles of road completed, New York had 692 miles, Massachusetts had 604 miles and New Jersey had 1,111 miles. These roads are of better quality than most of the Indiana roads, and they cost from $2,500 to $6,000 a mile to build. Indiana had at the end of 1905, 16,269 miles of gravel and macadam roads, the former class costing $1,600 to $1,800 a mile and the latter $2,000 to $2,400. The average rate of increase is about 1,000 miles a year.

The Indiana roads are built on petition and are paid for by the property benefited, the township and the county.

The legislature of 1907 has given county commissioners an opportunity to extend the benefits of good roads to the cross roads and less traveled lines by giving them power, on petition of 50 freeholders in a township to build any road less than 5 miles long which will connect a completed improved road with any other improved road, with the township line, or with any street of an incorporated town or city in the township. The act also permits the building of such roads less than 5 miles long from the end of a street in an incorporated town or city in any direction without reference to its connection with an improved road at the other end.

Some sensational headlines in a daily paper give the impression that the commissioners are obliged to build the roads on petition and that the work is being overdone, but neither statement is true, most of the reports given under the headlines showing the entire satisfaction of the taxpayers with the law and that they are proceeding under it with judgment and economy. Putnam county has petitions for 54 of the short roads, 50 of which will be of broken stone and had 18 months ago 600 miles of improved road, much of it macadam. Hamilton county has 36 petitions and already has 450 miles of good road. Clinton county has 63 petitions and already has 460 miles of good road. Morgan county has 16 petitions and now has 150 miles of good road. These are the counties going into road construction most rapidly. Others are less anxious and many counties have no petitions. The option of the county commissioners and the limit of indebtedness to a small percentage, 2 per cent. constitutionally, will keep the road building within safe limits.

The rapid extension of good roads during the last 20 years has shown all the farmers their benefits and they are practically unanimous in their opinion that the Indiana form of good roads is worth all it costs. The new law will bring the side roads up to the level of the main roads and thus give all the farmers the benefits of the roads that have been built.

The future improvement of the main roads to meet the demands of automobile traffic, and the prosperous farmer is one of the prominent users of the automobile, can then take place without the complaint that the side roads are neglected for the benefit of the main roads.

Another good law passed by the last legislature is one requiring the levying of a tax for road repairs of not more than one cent on $100 valuation for each 10 miles of completed road, which may be increased to 3 cents in counties which have less than 50 miles of improved road. There are less than 20 counties in the state to which the latter proviso will apply. A system of district supervision of repairs, under the county commissioners as members of a board of road directors promises to give some system to the repairs although it is not yet put into the expert hands which the increasing importance of the work demands.

Indiana has felt the increase in value of property with increase in distribution of good roads and will not now be delayed by the sensational newspaper whose scare headlines are not supported even by its own special dispatches.

Public Improvements in Knoxville, Tenn.

The city of Knoxville, Tenn., has entered on a period of public improvement work which shows that its citizens have been inoculated with the spirit of progress which is animating so many of the smaller cities of the country. New bridges, new sewers and particularly new pavements have been contracted for, some have been completed and others are now in progress. Capt. W. C. Crozer is now the city engineer and has charge of the design and construction of the new work. He is a civil engineer of many years experience in construction and is carrying out the plans for the improvements in very satisfactory manner. Like all engineers who wish to do good work he is undoubtedly needing more assistance in the form of competent inspectors and assistants, but municipal administrations which are entering upon new work on an unwontedly large scale are slow to appreciate the needs of the engineer's department.

The lack of familiarity with the work of the city officers and the tendency to compare the expenditures of one year with those of another without regard to the relative amounts of work give rise to acrimonious discussion occasionally. Knoxville is no exception. On the one hand complaints have been made of the quality of the concrete used in the street foundations, and expert engineers have reported that it is of good quality and fully equal to specifications. On the other hand comparison has been made

of the monthly expenditures in the city engineer's office as compared with those of former years. The city engineer should find it easy, however, to show his necessities and can, undoubtedly, demonstrate that still greater expenditure would be an economical measure for the city.

Meantime there are rather unpleasant discussions in the daily papers and the council meetings which, as indicated by the facts presented on both sides, can only result in the decision that the expenditures are necessary or in material reduction in the efficiency of the engineer's department in case the council should reduce the already small allowances to that department.

The proper basis of comparison of expenditures of one year with others is of the ratios of engineering expense to amount of contract work done. The expenditures of the city engineer's office reported are very small when compared with the amount of work under contract and construction. This sums up something like $300,000 for paving alone, while the pay rolls referred to run from $330 a month in February to $843 in June, certainly a very small proportion of the portion of the contract work done in the months of the construction season, and indicating foresight and economy of time and labor in doing the necessary preliminary work and the daily engineering and supervision.

Decision on Use of Patented Pavements in Louisiana.

The Supreme Court of Louisiana held, in the recent case of Lacoste vs. City of New Orleans et al., that the fact that a pavement was patented was no obstacle to full and fair competition upon a municipal contract for the laying of it when the patentee had filed with the city authorities an agreement to let the successful competitor for the contract have the free use of the patent upon payment of a fixed royalty, thereby placing all prospective competitors upon an equal footing, it appearing that the royalty thus exacted was reasonable and did not destroy the margin of profit under the contract. The court further held that it was no answer to say that the patentee could underbid his competitors for the contract; that to him, as to the other bidders, the sole inducement for bidding on the contract was the margin of profit which he saw in it, and that for him, as for all others, this margin of profit began only after the royalty had been paid.

Right of Action for Property Damage by Interurban Road on City Street.

The Supreme Court of Indiana held, in the case of Kinsey vs. Union Traction Company, that the fact that a landowner had sold his property after bringing an action against a railroad for an injunction against further operation and for accrued damages did not require the dismissal of his pending appeal in such case so far as it involved the question of damages, and that an owner of lands abutting on a street along which an interurban railroad was operated on a street railroad track, carrying packages and express matter under a franchise duly granted by the city, was entitled to recover special damages for the injuries peculiar to himself as owner of such property, as distinguished from the general injury suffered by all abutting owners or by the public. Such operation, the court said, did not constitute an additional servitude upon that portion of his land lying in the street.

Increase in Pittsburg Gas Rates.

In a letter to Mayor Guthrie, of Pittsburg, Pennsylvania, July 6, Governor Stuart declined to take any action in the case of the Philadelphia company, which has raised gas rates to Pittsburg consumers 20 per cent. Some time ago Mayor Guthrie, with officials of the Chamber of Commerce at Pittsburg, went to Harrisburg, and laid the case before Governor Stuart, asking that the charter of the company be annulled at once. Governor Stuart, in his reply, told Mayor Guthrie that he should apply to the Attorney General of Pennsylvania and not the Chief Executive. In the meantime the increase in gas rates has gone into effect.

Reinforced Concrete Telegraph Poles.

Experiments with concrete as a material for telegraph poles were described at the convention of the Railway Telegraphers held recently at Atlantic City, N. J., by G. A. Cellar, superintendent of telegraphs of the Pennsylvania Railroad lines west of Pittsburg. He said:

J. B. McKim, superintendent of the western division of the Pennsylvania lines west of Pittsburg, made and set up last year, near Maples, Indiana, fifty-three concrete poles of graceful proportions. They have, thus far, given entire satisfaction and show no sign of decay.

The concrete poles were set to a depth of five feet in concrete, and, after standing long enough to permit the cement to become solid, they were

tested. An iron clevis was placed around the pole to be tested ten inches from the top, to which a wire rope was attached, leading over a pulley placed at the same height and at an equal distance from the pole, so as to form a right angle, and fastened to a differential pulley block which was attached to a laboratory weighing machine.

After the cement poles had been broken the reinforcement so held them that it required almost the breaking pressure to further deflect them from their slightly inclined position. It showed them to be stronger than cedar poles.

The Richmond Home Telephone Company, at Richmond, Indiana, has found the use of reinforced concrete telephone poles very satisfactory and that they are practically indestructible.

Production of Portland Cement in Canada.

The total quantity of Portland cement manufactured in Canada during 1906 was estimated at 2,152,562 barrels, compared with 1,541,567 barrels in 1905. Fifteen companies were operating plants in Canada during the year. The average price per barrel was $1.49, compared with $1.42 in 1905. The Canadian cement importations last year amounted to 604,503 barrels.

MUNICIPAL AND TECHNICAL LITERATURE

Police Department Information — Administration of Manhattan Borough— Municipal and State Reports — New Publications.

Police Department Information for Citizens.

The police commissioner of New York city, borough of Manhattan, has issued a booklet of "Information for Citizens" for general distribution, which is intended to bring the department nearer to the people it serves by showing how the services of officers can be promptly secured, and giving information about duties of officers so that citizens may know what can properly be demanded. Most of the booklet is occupied by maps showing the boundaries of the police precincts and the locations of the station houses. The number of miles of streets in each precinct and the areas are also given. These areas vary from 0.04 square mile for the City Hall district bounded by Chambers, Broadway, Park Row and Center streets, to 2.5 square miles for the district at the north end of the island, above 145th street and between the two rivers. The number of miles of street in a district varies from the six miles in the Mulberry street district to 46.4 miles in the district at the upper end of the island. The City Hall and Central Park districts are not included in this comparison, the length of streets not being given for them. Undoubtedly the City Hall district has the shortest length of streets as well as the smallest area.

Administration of Manhattan Borough.

The Commissioners of Accounts of New York City, an important part of whose duties is the investigation of the various departments of the various boroughs of the city, has made a report of its investigation of the administration of President Ahearn of the Borough of Manhattan. The local opinion of the situation as expressed by the New York Tribune is as follows:

There does not seem to have been much corruption. There was politics, of course, plenty of it, in the office, and favoritism in dealing with political contractors, and padded payrolls, too, for the benefit of the cheaper henchmen; but this does not account for all the mismanagement. Incompetence seems to explain more than anything else. The office was conducted utterly without system, and there was no one in it competent to frame a system. An instance will show what we mean: The commissioners report that lack of funds was not the cause of the inability of the bureau of highways to keep the pavements in repair. With more than two millions available Ahearn spent little more than half of it. He simply had no means of learning what streets needed repair. There was no regular method of inspection. Now, of course, with a million or so unspent, a man making the most of the political possibilities in the office would have

found or made work on which to spend the money. The office was deeply in politics, but even in politics it was incompetent. That unspent million would have "taken care" of a host of henchmen and favored contractors, but Ahearn did not even have a system which would tell him how and where to spend it.

With reference to the bureau of highways some of the recommendations of the report are as follows:

Our examination disclosed a totally incompetent administration of the affairs of the bureau, the improper conduct of work, inadequate inspection, conversion of funds and irregularities in the payroll. We recommend in this connection:

First—The concentration of responsibility for the work of the bureau in a single, technically competent head; this head to be an engineer, having control over the entire work. In our judgment, the head of this bureau should be responsible for the condition of the highways and thoroughly competent technically to discharge this responsibility.

Second—The revision of the specifications for repaving with sheet asphale, asphalt block and wood block pavements.

Third—The organization of a system of inspection and report to insure compliance with the specifications of contracts.

Fourth—The reorganization of the routine inspection of the pavements to insure their proper maintenance. A necessary part of this reorganization will be the dismissal of all the inspectors who have proven themselves incompetent, who, according to the former chief engineer, George R. Olney, constitute 50 per cent. of the force.

Fifth—Enforcement of the provisions of maintenance contracts by forfeiture of bonds and exclusion of defaulting contracts from future bidding.

The recommendations on other bureaus examined are based on the following findings:

With respect to the Bureau of Sewers: First—Incompetent and useless superintendent. Second—No executive supervision of work. Third—Repeated evasions of Section 419 of the charter, benefiting a favored contractor. Fourth—Incompetent inspectors. An efficient chief engineer.

With respect to the Bureau of Incumbrances: First—No systematic method of work. Second—Lack of executive supervision. Third—Subordination of bureau functions to political purposes. Fourth—Absence of control over work of favored contractor.

With respect to the Bureau of Buildings: First—No supervision exercised over favored contractor. Second—Exorbitant charges allowed contractor. Third—Evidence of corruption of bureau's inspectors. Fourth—Abrogation of Building Code by the use of official discretion. Fifth—Frequent violation of code permitted, endangering lives and property. Sixth—Contradictory rulings of superintendent in similar cases.

The report has been transmitted to the Governor of the State who has the power of removal of the Borough President, who is the responsible head and through whose action reforms can be brought about.

A new Commissioner of Public Works and a new Chief Engineer of the Bureau of Highways have already been appointed and may be able, under the improved conditions resulting from the exposure of the former political methods of appointing subordinates to produce better results than their predecessors.

Municipal and State Reports.

Annual Report of the Water Department, Woburn, Mass., 1906. R. E. Walsh, Water Registrar.

The annual reports of this department usually state that the greatest number of breaks in water mains on any one account is from the action of lightning. Thus in 1906 seventeen of the forty-five breaks were from this cause. Cement-lined pipe is in use and apparently all or nearly all of the breaks were in this kind of pipe, eleven occurring from thin lining, four from rust, eight from closings of hydrants, with five leaks at joints. That four lines of cement pipe weakened by lightning and one other cement pipe line should be replaced, is the judgment of the superintendent.

The report uses the standard form of summary of statistics. Receipts for the year were $47,619.72 and expenditures for maintenance were $16,725.32, and for construction were $14,042.33. The balance of the receipts after deductions of maintenance and other small accounts, $30,125.19, was transferred to some sinking fund and the construction was paid for from an issue of $10,000 bonds and transfers from other funds, and shows an overdraft. This is apparently a peculiarity of financial accounting, which is not made any clearer by the statement that the bonded debt to date is but $10,500 and the sinking fund has no stated value. Possibly the bonds are issued by the city for general purposes and the water department has nothing to do with them except to transfer its profits, which are nearly two-thirds of the total receipts, to the city funds for application on the city's general debts. In other words, the water department's customers pay for their service nearly three times what it costs and thus reduce the taxes upon such property owners as do not use water in proportion to the value of their property. It is reported that 14,300 of the 14,400 population of the city are supplied with water from the city's system, so that the inequality is only

in the lack of conformity of amount of water used with value of property owned; for example, the user of water who is not a taxpayer helps to reduce the taxes by the large excess of his payments for water service over the cost of the service.

First Annual Report of the Illinois Highway Commission, 1906. A. N. Johnson, State Engineer, Springfield, Ill.

The commission's first report shows that the work is in good hands and that an excellent beginning has been made in the study of Illinois conditions and methods of meeting them. The fact that over $4,625,000 a year is spent on the roads and bridges of Illinois is evidence of the importance of the work of the State Highway Commission, and the lack of proper road making materials in the State makes a very strong demand for an expert study of the question. This has begun and the first report describes the present method of road administration; the formation of local road associations; special macadam, gravel, brick and toll roads and special conditions; highway bridges and specifications; and gives data regarding the annual expenditures for roads and bridges, obtained from official sources; the conditions of the roads as reported by the rural letter carriers; the local road meetings attended; the amount of traffic on certain selected roads during the months from February to October; tests of road materials; "free" macadam, furnished from the state prisons; and experimental roads. Several of these subjects will receive attention in MUNICIPAL ENGINEERING. The report, with its valuable statistics and descriptions, will doubtless be sent to those interested in the subject on application to Mr. Johnson.

Twenty-Second Annual Report of the Board of Gas and Electric Light Commissioners of Massachusetts, 1906.

This report is unique in that there is no information in it concerning the names of the members of the Board or the location of their office, even the name of the state appearing only in the cover and title page of the report. Notwithstanding the modesty of the members of the Commission the report is one of the most valuable which is issued by a state department. The present report is particularly valuable for its study of the results of municipal ownership of gas and electric light plants in the state and for the opportunity which it gives for comparison of the results of municipal and private ownership. Some of these figures will be used in articles under preparation for early publication in MUNICIPAL ENGINEERING.

The title indicates that Massachusetts assumed a certain control of gas and electric lighting plants twenty-two years ago and the contents of the report show that in the main this control has been judiciously exercised and the results have been beneficial to companies, municipalities and consumers. The tables of statistics are for the year ending June 30, 1906, and are full and clear, giving data for almost any desired investigation of conditions and comparison of results.

To give an idea of the manner in which the Commission handles the questions which come before it, the following reports of action on cases decided are quoted, which show also two classes of matters over which the Board has jurisdiction:

1. "This was a petition by customers of the Quincy Electric Light and Power Company for a reduction in the price of electric light and for improvement in the quality of the service. The petitioners and the company were represented at the hearing, which was in Quincy.

"The defects in the service, which were described by the petitioners and which occurred at about the period of maximum output, were of a character to suggest a possible lack of capacity in the generating or distributing plant. Since the hearing the company has expended a substantial sum in enlarging and improving both divisions of its plant, and has apparently made ample provision against the recurrence of these difficulties. Incidental to the payment for these improvements and a portion of its debt the company increased its capital stock from $100,000 to $149,800. It has now outstanding bonds for $100,000 and notes for approximately $90,000.

"At the date of the petition the company's price for lighting was 20 cents per kilowatt hour, with discounts for prompt payment ranging from 10 per cent. on the smallest monthly bill to 25 per cent. for bills of $40 or more per month. Since the hearing the company has begun to make free renewals of incandescent lights, changing from the previous practice of charging 25 cents a lamp for the sizes in common use; and has extended its scale of discounts to consumers whose bills are $50 or more per month by a varying scale up to 50 per cent. on monthly bills of $100 and over.

"This company began to supply electric light in Quincy in 1888, and has extended its lines very generally throughout the municipality. It has practically no consumers who use a large amount of current, the number of small consumers being unusually large.

"During its entire history it has paid very moderate dividends, or none at all; and prior to June 30, 1905, had not divided over 6 per cent. in any year. Its affairs have been managed with economy, although the company has met with its share of those losses which have been incident to the progress of the art and the development of a business which was new, and in its early years but imperfectly understood. Its present plant is in every respect modern, of high efficiency, and economical in its operation. Its present dividends are moderate, and its profits have never been extravagant.

"Although liberal discounts have been offered to large customers, fully one-half the commercial lighting is supplied at the highest net price, and the average received for the entire commercial lighting is only a fraction of a cent below the highest net rate. Notwithstanding the price for commercial lighting may seem high when compared with some other companies, the average price received for the entire output, a factor of very great importance, is less than 11 cents, which is a low price for a company of this size and character. The reason for this is to be found in the arrangement between the city and the company for the lighting of the streets.

"More than two-thirds of the company's output and probably an equal proportion of its investment is for street lighting alone. The company's prices for this service have gradually tended downward, until they have reached a point which barely meets the operating cost, with no provision for depreciation, interest or dividend, and the entire burden of such charges is thus thrown upon the supply to private consumers. While the Board is unwilling to approve the policy which has brought about these conditions, it has no authority to increase these prices. We are not familiar with the reasons which have led to them, nor are we prepared to say that, having been now reached, they ought to be increased. It is very plain, however, that the facts are of such importance that they control the situation, and that, if the price for street lighting were increased, a corresponding decrease might be made in the commercial lighting price.

"The company's entire business has hitherto yielded to its stockholders no more than a fair and reasonable compensation for all the service it renders to the public. The fiscal year ending June 30, 1906, showed an encouraging increase in its volume. The probable maintenance of the present output will enable the company to make some reduction in its commercial lighting rates. Any further reduction is likely to come only from some improvement in the rates for public lighting, a further increase in the volume of the commercial business, or by a reduction in some way, not now apparent, of the cost of operation. The Board recommended:

"That, on and after the first day of August next, the net price charged by the Quincy Electric Light and Power Company for commercial electric lighting shall not exceed 17 cents per kilowatt hour."

2. "This was an application by the Fall River Gas Works Company for the approval of an issue of 1,150 shares of new capital stock, of the par value of $115,000, to meet the cost of additions to the company's plant. These additions, described in the company's petition and at the hearing, had been completed, and the cost of the same was included in the liabilities of the company at the date of the decision. There were, however, available funds for the payment of a large portion of this debt. For the balance of this indebtedness, which existed on account of additions referred to, new capital stock may properly be issued. The following was therefore adopted:—

"On the petition of the Fall River Gas Works Company, pursuant to the provisions of section 24 of chapter 109 of the Revised Laws, for the approval of an issue of additional capital stock, of the par value of $115,000, for the objects named in said petition, after public notice and hearing, it being deemed by the Board that the amount of stock hereinafter named is reasonably necessary for the purpose for which such stock is authorized, it is—

"Ordered, That the Board hereby approves of the issue by the Fall River Gas Works Company, in conformity with all the requirements of law relating thereto, of 550 shares of new capital stock, of the par value of $100 each, the proceeds of said stock to be applied to the payment and cancellation of an equal amount of the prom-

issory notes of the company now outstanding and to no other purpose.

"And, for the purpose of determining the price or rate at which the said shares shall be offered proportionately to the stockholders of said corporation, pursuant to the provisions of section 30 of chapter 109 of the Revised Laws, it is further—

"Ordered and determined by the Board, taking into account previous sales and other pertinent conditions, that the market value thereof for the purpose aforesaid be fixed at $185 a share; and if any shares shall remain unsubscribed for by the stockholders entitled to take them under the provisions of said section, it is further—

"Ordered, That all such shares shall be offered for sale at some suitable place in the city of Boston, and that notice of the time and place of such sale shall be published in the "Boston Daily Advertiser," a newspaper published in the city of Boston, and in the "Fall River Evening News" and the "Fall River Daily Globe," newspapers published in the city of Fall River. (August 23.)"

Twenty-ninth Annual Report of the Board of Health, Lowell, Mass., 1906. Thomas J. Beane, Secretary.

There is nothing out of the regular line of work in this report except a little trouble with rabies and no complaint except of the failure of council to appropriate money to establish a contagious diseases hospital as required by law.

Since 1900 the board has disposed of swill by selling it at prices approximating the cost of collection. Thus in 1906 the labor cost of collecting was $8,721.80 and the income in cash and exchange for hay was $6,062.90. Market refuse to the extent of 1,046 tons was burned at a cost of $1,762.

Report of Battle Creek, Michigan, Waterworks, 1906. W. W. Brigden, Superintendent and Civil Engineer.

Mr. Brigden condenses his report into two pages and gives nearly all of the important items, with comparisons of the statements for the past four years. For the sake of uniformity he could add, with advantage, the standard forms of reports adopted by the waterworks and municipal associations.

There are several interesting statements and unique tables in the report. Thus it says that the plant pays all operating expenses, interest and construction out of net earnings and but 70.5 per cent of the water furnished is paid for. A table shows the percentages of water used for various purposes, and that this table is kept up to date is shown by comparing the items for 1904 and 1906, as shown in the following table:

Water, How Used or Wasted.	Per Ct. of Whole, 1904.	Per Ct. of Whole, 1906.
Paid for by meter (10.7 cents av. price in 1904, 1½ cents in 1906	54.5	66.5
Paid for, not metered	5	4
Parks and public buildings	8	5
Schools, including lawns	6	3
Drinking fountains for horses	5	4
Flushing sewers	0.5	0.5
Blowing off hydrants	0.5	0.5
Wetting down sewer, water and other trenches	2	2
Fires	4.5	3
Slip of pumps	3	3
Under-registration of meters	4	4.5
Leaks	7	4

It will be noted that only 59.5 per cent. of the water was paid for in 1904 and 70.5 per cent. in 1906. The cash value of water paid for and otherwise provided is shown by computing the total of each item at 10 cents a thousand gallons, the total consumption in 1904 being 503,000,000 gallons and in 1906 447,000,000 gallons.

The profits of operation of the works were $8,180 in 1906. If depreciation is figured at 5 per cent of the total cost ($393,000), the deficit is $11,500. To offset this deficit, the city has free of charge the use of 487 hydrants and $6,000 worth of water for public purposes, which, at $40 a hydrant will give $14,000 profit to the city over a policy of paying a company for the public water at reasonable prices. The plant has only $30,000 bonded debt and pays construction work out of its net earnings. New construction was $16,000 in 1906, $8,500 being for new mains and services. The amount of water pumped has decreased 11 per cent since 1901 and the per capita consumption from 68 to 47 gallons a day with an increase of population of 6,000 (now 26,000). The receipts for metered water per 1,000 gallons have been reduced from 11.7 to 11.2 cents from 1901 to 1906, but the average receipts from all water pumped have increased from 4.8 cents to 7.7 cents, showing commendable activity in cutting off unauthorized uses and leaks. No new pumps or boilers have been purchased for 20 years. Perhaps this accounts for the reduction in duty of pumping plant from 45,000,000 in 1901 to 34,000,000 in 1906.

Mayor's Message to the City Council of Portsmouth, Va., Together with Municipal Reports for 1906. J. Davis Reed, Mayor.

Portsmouth expects some of the visitors to the Jamestown Exposition to get across the river this year and the mayor asks for larger appropriations for keeping the streets clean and in good condi-

tion. The expenditures for street cleaning in 1906 were $10,521, and for repairing, including brick, stone and shell, $4,752. The mileage of streets cleaned is not given. The population of the city is about 38,700.

The report gives no statement of the amount of existing improvements. City Engineer, Bascom Sykes, reports 2,505 feet of brick pavement on concrete base laid in 1906 at a cost of $25,052, of which $5,572 was paid by the street railway company. A storm water drain cost $2,565 and sewer repairs cost $976. This seems to have been all the work done under his department.

Although the assessed valuation of property is but $8,383,724 the bonded indebtedness is $1,031,800. This is less, however, than the statute limit of 18 per cent of the $7,000,000 real estate valuation. Indebtedness for school purposes ($25,000), paving and grading ($405,000), sewers ($115,000), which are met by special assessment in many cities or not included in the statements of general city indebtedness, make up more than half the total. The assets of the city, including some $180,000 of unpaid taxes and paving assessments, the sewer system ($125,000), etc., are $83,137 more than the bonded indebtedness.

An important item in the receipts is $30,800 from the ferry, the city's interest in which is valued at $400,000.

The water supply is owned by a company which has put in a filter plant of 6,000,000 gallons a day capacity which has greatly improved the water.

The mayor asks for a better system of accounting, and the reports would be more convenient if the information were arranged by some single official instead of scattered through the reports of many. While the financial reports seem to be complete, the record of the permanent results of expenditures is very meager, especially in paving, sewers, and buildings.

Nineteenth Annual Report of the Board of Commissioners of the Water and Lighting Department, Harrisburg, Pa., 1906. Geo. G. Kennedy, Superintendent and Secretary.

Much of this report is devoted to a full description of the new mechanical filter plant which was put in operation late in 1905 and ran throughout 1906. There are some interesting problems in the operation of this plant which are described in the report. Some abstract of this part of the report will be given later.

The plant paid $61,474 current expenses, $14,405 extraordinary expenses and betterments, and $34,552 interest, a total of $110,432, and had a cash balance of $71,838, besides furnishing $33,943 worth of water free to the city for fire protection and public uses and to various charitable and church institutions, and rebating $12,051 on water pipe assessments out of water rents. Two-thirds of the water used is metered, there being 7,648 meters for 10,043 taps and only 3,836 taps without meters. The receipts from metered water are 80 per cent of the total receipts, more than half the water pumped being used for manufacturing and motor purposes and paid for by meter measurement. The consumption per capita for domestic and public requirements was 68 gallons and for manufacturing was 81 gallons. The cost of pumping water was less than 0.9 cent per million gallons one foot high. The cost of supplying water to consumers was $19.56 per million gallons, figured on total maintenance, and $29.03 if interest on bonds is included.

The standard form of summary of statistics is used.

New Publications.

Electrical Wiring and Construction Tables. By Henry C. Horstmann and Victor H. Tonsley. 120 pp. Leather, $1.50 net. Frederick J. Drake & Co., Chicago, Ill.

The restriction of matter in this book to strictly electrical matters makes the work a very convenient pocket book of wiring and material capacities and sizes, for the daily use of all interested in wiring problems, from wireman to architect and engineer.

The direct current wiring tables are for 110, 220, 440 and 550 volt currents, each accompanied by a diagram. The alternating current wiring tables are for 1,000, 440, 220, 110 volt currents, and 25, 60 and 125 cycles, a table and accompanying diagram being on opposite pages for convenience in taking off quantities.

The third set of tables and diagrams is for use in selecting the most economical set of conductors for given or assumed conditions. The miscellaneous chapter gives data on various electric lamps, carrying capacity, weight, etc., of various wires, pole line data, formulae, measurements of surfaces and volumes, wire equivalents, and standard symbols. Tables for calculations of materials, charts and tables of various conduit and wire combinations, tables of carrying capacities under various systems of rules, and tables of various insulations, conduit dimensions, ratings of lamps and motors, etc., are also given.

ORGANIZATIONS AND INDIVIDUALS

American Society of Municipal Improvements—Promotion of Engineering Education—Technical Meetings—Personal Notes.

American Society of Municipal Improvements.

The local committee which is arranging for the next meeting of the American Socley of Municipal Improvements at Detroit, Mich., in September, has its preliminary work well in hand. The Armory will be used for the exhibits of materials and machinery of interest to municipalities, which promises to be one of the attractive features of this year's convention. Mr. R. K. Davis, chairman of the committee on exhibits last year did not receive his appointment until late and he worked at long range, but he got together a very creditable exhibit at Birmingham. With a whole year and with the convention in his own city he will be able to greatly improve upon that good result.

The arrangements for the exhibits, the decorations, the musical and other attractions, are very attractive to hear about and the methods of caring for the convention, of showing the beauties and the municipal improvements to the members, of taking care of the ladies, are equally comprehensive. Mr. Davis expects to have the best preparation for the physical wellbeing of the convention that has ever been made. The intellectual part is always good and will certainly be equal to any previous meeting under the able leadership of President Sherrerd. Geo. W. Tillson, the secretary, is now the Chief Engineer of the Bureau of Highways of the Borough of Manhattan, having been moved across the river from Brooklyn where he has been located for so many years.

Society for Promotion of Engineering Education.

The fifteenth annual convention of the Society for the Promotion of Engineering Education was held at Cleveland, Ohio, July 1, 2 and 3. Among the papers submitted were the following: "The Relation of Philosophy to Science," Bassett Jones, 1 Madison Ave., New York City; "Engineering Education Before and After the War," Prof. J. Burkitt Webb, of the Chair of Mathematics at the Stevens Institute of Technology, Hoboken, N. J.; "Engineering Chemistry and Chemical Engineering," Dr. Charles F. Mabery, Professor of Chemistry at Case School; "An Educational Experiment," William G. Raymond, Dean of the College of Applied Science and Professor of Civil Engineering at the University of Iowa; "Pedagogic Methods in Engineering Instruction." Dean Kent, of Syracuse; "The Relative Efficiency of Instruction in Engineering Subjects," James M. White, Professor of Architectural Engineering and Dean of the Engineering College, University of Illinois; "Basic Principles in the Construction of a Text-Book," Professor Stephen E. Slocum, of the Chair of Applied Mathematics, University of Cincinnati, read by Prof. Magruder; "Methods of Studying Currrent Technical Literature," Prof. H. H. Norris, and read by Prof. Magruder; "The Building and Equipment of the Rockefeller Physical Laboratory of the Case School," Dayton C. Hiller, Professor of Physics at the Case School; "The Six-Days System at the University of Minnesota," Prof. Frank H. Constant, of the Department of Structural Engineering, University of Minnesota; "The Work of the Freshman and Sophomore Years of the Engineering Course," Fred A. Fish, Associate Professor of Electrical Engineering at the University of Iowa; "A Combined Cultural and Technical Engineering Course," Prof. George R. Chatburn, of the Chair of Applied Mechanics and Machine Design, University of Nebraska; "Technical Education with a View to Training for Leadership," by President F. W. Atkinson, of the Polytechnic Institute of Brooklyn, read by Prof. Magruder; "The Work of the Dean of a School of Engineering," Louis E. Reber, Dean of the Engineering School, Pennsylvania State College, read by Prof. A. J. Wood; "A Course in Physics for Engineering Students,"

Prof. Franklin, of Lehigh University, and "The Teaching of Elementary Mechanics," a paper prepared by Prof. Franklin and his assistant, Prof. Barry MacNutt. A number of other papers were also read. Officers were elected as follows: President, Charles S. Howe, Case School of Applied Science; first vice-president, Dean Wm. G. Raymond, of University of Iowa; secretary, Arthur L. Williston, director of Department of Science and Technology, Pratt Institute, Brooklyn; treasurer, William H. Wiley, of John Wiley & Sons, publishers.

Technical Meetings.

At the request of Surgeon-General Wyman, chairman of the International Sanitary Bureau, Director Barrety, of the Bureau of American Republics, has issued a call for a third international sanitary convention in the city of Mexico, December 1 to 7 inclusive, 1907.

The fifteenth National Irrigation Congress will be held at Sacramento, Cal., September 2 to 7 inclusive.

The seventh annual convention of the Union of Canadian Municipalities will be held at Port Arthur, Ont., August 13 to 16. W. F. Lighthall, secytreas.

The South Carolina Good Roads Association will meet in Spartanburg August 7 and 8.

The second annual convention of the National Association of Comptrollers and Accounting Officers will be held at the Hotel Jefferson, Richmond, Va., September 17, 18 and 19. Howard C. Beck, secretary, Detroit, Mich.

The annual meeting of the International Association of Municipal Electricians will be held at Norfolk, Va., Aug. 7, 8 and 9. Frank P. Foster, Corning, N. Y., secretary.

The eleventh annual convention of the League of American Municipalities will be held at Norfolk, Va., September 18, 19 and 20. John MacVicar, 611 Trinity Building, New York City, secretary-treasurer.

The first annual convention of the Playground Association of America was held in Chicago, June 20, 21 and 22. A number of papers were read. Officers were elected as follows: President, Dr. Luther Gulick, New York City; first vice-president, H. B. F. MacFarland, Washington, D. C.; second vice-president, Jane Addams, Chicago; third vice-president, Joseph Lee, Boston, Mass.; treasurer, Chas. L. Hutchinson, Chicago; secretary, Henry S. Curtis, Washington, D. C.

Predictions have been made that the next meeting of the National Association of Cement Users will be held in Buffalo, N. Y., but there is no indication as yet that the city will meet the requirements as to exhibit space and convention hall made by the officers.

The Public Utilities Commission for New York City officially went into existence July 1, with the following members: Chairman Willcox and Milo Roy Maltbie, of Manhattan; John E. Eustis, of The Bronx; William McCarroll and Edward M. Bassett, of Brooklyn. The new commissioners visited the offices of the inspector of gas meters, the gas commissioners, the rapid transit board and the board of railroad commissioners.

The Machinery Club of the city of New York has been organized with F. H. Stillman as president and Theodore Waters as secretary with temporary offices at 26 Cortlandt street. The club will have two or three floors of the new Fulton Terminal building on Church street and is expected to become the headquarters of the machinery trades when visiting the city.

Personal Notes.

Henry G. Bradlee is now a member of the firm of Stone and Webster, of Boston, Mass.

Frank McMahon was elected first mayor of the new borough of Rumson, N. J., July 16.

Hon. Peter Fillion, mayor of Bedford, Indiana, died July 12, of Bright's disease, aged 62 years.

M. B. Haynes has been appointed city engineer of Mankato, Minn., in place of J. R. Thompson, resigned.

Dr. Edward R. Taylor was elected mayor of San Francisco, Cal., July 16, by the board of supervisors.

Textor & Aftel are engaged in the practice of architecture at 912-913 The Spitzer Building, Toledo, Ohio.

W. C. Hood, of Lawrence, Kas., has been elected sanitary engineer of the Kansas State Board of Health.

The Freeborn Engineering & Construction Co., Kansas City, Mo., has removed its offices to 605-615 Scarritt Building.

F. J. Connor, formerly with the waterworks at Faribault, Minn., has been appointed superintendent of the water-works of Sioux Falls, S. D.

James Birmingham has resigned as president of the Board of Water Commissioners, at Hartford, Conn., which position he has held for a number of years.

Richard T. Fox, of Chicago, has been engaged by a citizens' committee of Boston to investigate the condition of the streets and street department of that city.

George P. Carver has opened an office in the Exchange Building, 53 State street, Boston, Mass., as a specialist in the design and construction of reinforced structures.

Messrs. C. L. Hosmer, C. B. Breed, and George E. Russell have been promoted to be assistant professors of

civil engineering in the Massachusetts Institute of Technology.

Prof. William R. Hoag has retired from the faculty of the civil engineering department of the University of Minnesota and will engage in private practice in Minneapolis.

B. J. Sigmund has resigned as chief assistant engineer with Tucker & Vinton, New York City, to accept a similar position with the Concrete Engineering & Supply Co., of that city.

F. J. Connor has resigned as superintendent of water-works, at Faribault, Minn., and accepted a position as superintendent of the Sioux Falls Water Works, at Sioux Falls, S. D.

John Patrick Kane, president, treasurer and a director of the John P. Kane Co., manufacturers of building material and Portland cement, died July 9 at Huntington, L. I., aged 58 years.

Dr. Walter Bensel, sanitary superintendent of the Department of Health of New York City, has been appointed Street Cleaning Commissioner of that city, succeeding McDonough Craven, resigned.

A. D. Hatfield has resigned as secretary and treasurer of the Wellman-Seaver-Morgan Co., of Cleveland, and was succeeded by W. H. Cowell, formerly of the Algoma Steel Co., Sault Ste. Marie, Ont.

Fred E. Foss, M. Am. Soc. C. E., has resigned as Professor of Civil Engineering at the Pennsylvania State College to accept a similar position in the School of Applied Science of the Carnegie Technical Schools.

Gilbert C. White, Assoc. Mem. Am. Soc. C. E., has opened offices in Durham, N. C., where he will practice as consulting engineer on water-works, sewerage, street improvement, water filtration and sewage disposal.

Andrew Rosewater, city engineer of Omaha, Neb., has been employed by the city of Chicago to install an asphalt testing plant, assist in revising the asphalt pavement specifications and instruct city asphalt inspectors.

Curtis Hill, of St. Louis, has been appointed State Highway Commissioner of Missouri by the State Board of Agriculture, and will begin at once the engineering work on the highway between St. Louis and Kansas City.

George R. Bascom, a pitometer expert in charge of waste-water investigations for the water department of Philadelphia, Pa., is now engaged with John A. and Edward S. Cole, consulting engineers of Chicago and New York.

L. E. Moore, instructor in theoretical and applied mechanics, University of Illinois, has been appointed assistant professor of civil engineering in the Massachusetts Institute of Technology, succeeding Prof. F. P. McKibben, resigned.

Luis Barragan, chief engineer of water-works at San Luis Potosi, Mexico, is in this country studying water purification plants. He has investigated the plants at San Antonio, St. Louis, Charleston, W. Va., Washington and Philadelphia.

Mortimer G. Barnes, of Petersburg, Neb., has been appointed a division engineer of the Board of Water Supply, of New York City, and Stephen Koronski of Philadelphia, and Clifford Lynde, of Oil City, have been appointed assistant engineers in the same department.

Chester A. Garfield and Edward T. Granlienard, of Cambridge, Mass., and Hicksville, N. Y., respectively, have been appointed assistant engineers in the service of the Board of Water Supply of New York City. Hobart B. Potter, of Newark, N. J., has been appointed assistant engineer.

Dr. Henry S. Pritchett, president of the Massachusetts Institute of Technology for the last seven years, ended his service with that college recently, having tendered his resignation some months ago. Owing to the failure of the trustees to secure a permanent head for the school, Arthur Ames Noyes, professor of theoretical chemistry, will act as president until the vacancy is filled.

A. W. Dow, Ph. B., the well known specialist in paving materials, and formerly inspector of Asphalts and Cement for the City of Washington, D. C., has entered into partnership with F. P. Smith, Ph. B., under the firm name of Dow & Smith. Mr. Smith has had long experience in refining and laying asphalt, both in this country and abroad. He has been chemist and asphalt expert for the Alcatraz Company, the Union Oil Company of California, the British Paving Company, Ltd., and the A. L. Barber Asphalt Company, and chemist for the United States Navy Department for a number of years. Both members of the new firm are graduates of the School of Mines, Columbia University, and they make a specialty of asphalt inspection for municipalities. They also act as consulting engineers on road surfaces of all kinds, water-proofing reservoirs, etc., and, in fact, all work involving the use of asphalts or bitumens of all kinds, including the distillation and refining of oils, both asphaltic and otherwise.

MACHINERY AND TRADE

Name Stamps for Cement Work.

With a good outfit it is so easy to stamp any desired letters or figures on cement work that this method of preserving marks is becoming very popular. Cement sidewalk contractors have long used individual stamps giving their names and addresses, but

these are seldom adjustable or changeable and can be used only for one purpose. The Adjustable Name Stamp Company of Clinton, Wis., have devised and recently patented an adjustable name stamp and printing device, which makes it easy to stamp any desired inscription on the surface of cement work of any description.

Forms are provided to hold as many lines of type as may be desired, with lock blocks to hold the type in place and handles for operating. The contractor can make up a name stamp giving his name and address, date of laying work, owner, or any other desired words or figures. A special form for dates is furnished if desired. The stamping of street names in sidewalks and curbs at street intersections is becoming quite popular. The form can be used for holding letters for such inscriptions, or the letters can be used separately if desired. Each letter is cast on a square plate, or on parallel strips, according to style chosen, which fix the proper spacing for the letters and the depth to which they can be pressed into the concrete. The projection of the plates or strips holding each letter above the walk surface make it easy to remove the letter after it has been used without leaving finger marks or other disfigurements. A special skeleton letter is recommended for this work. Letters can be furnished in shape to tack on form boards for placing concrete so that when the forms are removed the inscriptions will show on the surface. A catalogue and price list and full information will be sent by the company on request.

Hydraulic Ram for Irrigation Purposes.

The following from County Surveyor J. B. Gibson, of Kalispell, Mont., describes a successful use of the Rife hydraulic ram for supplying water to irrigate a cemetery:

Last season the Conrad Memorial Cemetery Association of this city, of which association I am a member of the Board of Trustees, installed a No. 120 Rife ram for the purpose of furnishing a water supply for a cemetery of about 85 acres, 50 acres of which is improved and provided with mains for irrigation. The ram is operated under a head of 18 feet and discharges, through 1060 feet of 6 inch pipe, to an elevation of 159 feet, with a supply of 750 gallons per minute, from 80 to 85 gallons per minute.

Our water supply for the ram is conveyed through an ordinary flume to a receiving basin or tank, and from the receiving basin to the ram through 12-inch standard iron pipe, and for discharge pipe from the ram to the point of delivery we use 6-inch wire-bound wooden pipe manufactured by The Pacific Coast Pipe Company, of Ballard, Washington. A wooden pipe equally as good is manufactured at Portland.

The machine is durable, easily installed, and simple in its operation, and after being adjusted requires little or no attention. The one we are using fulfills the guaranty made by the manufacturers, and is giving us perfect satisfaction.

If you have the proper conditions under which to operate a ram, you will find no cheaper or more satisfactory method of raising water. After the water supply is obtained and the machine installed the expense ceases. It is a mistake to try to make too cheap an installation, and you need not hesitate to go to the expense of providing a good substantial water supply, as the machine will work if you provide the proper conditions.

The Rife Hydraulic Engine Mfg. Co., 111 Broadway, New York, will give full information about the various sizes and methods of installation.

Flint Rock Macadam Pavement.

The two accompanying photographs are of two streets in Indianapolis which were laid with flint rock macadam about three years ago, and show their excellent condition without repair. These streets were laid under the following specifications regarding the material and method of placing:

1. Subgrade. The roadway shall be graded to a true and smooth surface and to the subgrade, as shown by the plans and profile, and by the stakes to be set by the city civil engineer. All soft and spongy places not affording a firm foundation shall be dug out and refilled with broken stone or gravel. She excavation for the subgrade of the gutters shall be made to the additional depth indicated by the drawings. The entire roadbed shall be thoroughly compacted by rolling with a steam roller weighing not less than ten tons. The gutters and such other portions of the roadbed as can not be rolled shall be thoroughly compacted with heavy rammers. Special care shall be taken where trenches have been made, to determine the condition of the filling, and the engineer may require them to be dug out and refilled with gravel or stone, if he considers it necessary.

2. Foundation. Upon the subgrade as thus formed and compacted shall be spread a layer of flint rock or novaculite, broken so that all of it will pass through a ring three and one-half inches in its largest dimensions, and not more than fifty per cent. of which will pass through a ring two and one-half inches in its largest dimensions. This shall be covered with bonding gravel in such quantity as to completely fill all interstices, then thoroughly sprinkled and rolled until well compacted with a steam roller weighing not less than ten tons, the part next to the gutters being rammed by hand with heavy tampers. This layer, after being thus rolled and compacted, shall not be less than six inches in depth at the center of the roadway, and not less than four inches next to the gutters.

3. Second layer. The foundation layer between the gutter lines shall be

covered with a layer of flint rock or novaculite of various sizes up to and not larger than will pass through a two and one-half inch ring in its greatest dimension. This shall be covered with fine bonding gravel, in such quantity as to fill all interstices, then raked and flooded, and rolled with a steam roller weighing not less than ten tons until thoroughly compacted.

FOREST AVENUE, INDIANAPOLIS, IND.
Diamond Flint Rock Macadam.

TACOMA AVENUE, INDIANAPOLIS, IND.
Diamond Flint Rock Macadam.

The bonding gravel shall be such as is approved by the city civil engineer. This layer, after being compacted, shall be of a uniform depth of five inches from gutter to gutter.

4. Finishing surface. Upon the above layer shall be evenly spread a one-half inch layer of flint rock or novaculite screenings, which shall be sprinkled and rolled into the layer below until it presents a true, uniform and unyielding surface, conforming to the finished grade of the street.

In all the above any depression must be filled as the rolling progresses.

5. Flint Rock or Novaculite. The flint rock or novaculite shall be equal to samples on file in the office of the city civil engineer.

10. Guarantee. The guaranty period for this improvement will be five years. The repairs under the guaranty shall be made in accordance with the following specifications: The roadway shall be kept at all times with a practically smooth and uniform surface. Any additional material necessary to accomplish this shall be the same as the wearing surface, and shall be applied after the surface of the roadway has been picked up, so that the new material will be bonded perfectly with the old. It shall then be thoroughly tamped or rolled to a uniform surface. Care shall be taken not to change the grade or crown of the street, or to interfere with the drainage from any part of the surface. This

specification applies to defects of surface due to cleaning (properly conducted) as well as to wear, and the thickness of the wearing surface shall be the same at the end of the guaranty period as when the improvement is completed and accepted. Any relaying or replacing of gutters or crossings made necessary on account of action of traffic or otherwise, shall be done by the contractor under this section. Repairs must be made from time to time as the necessity for the same appears, and general repairs at stated times will not be considered a satisfactory compliance with the specifications.

The flint rock used in these pavements was obtained from the flint beds at West Point, Ind., which are now the property of the Diamond Flint Co., of Lafayette, Ind. The material seems to be peculiarly adapted to use for macadam road surfaces. There are very few similar deposits, and this is farthest north of any and the only one known of exactly the same nature. This deposit is almost inexhaustible and can supply material for all the macadam streets within shipping distance. Mr. R. R. Moorman of Lafayette is the manager of the plant and will supply any detail of information about the material which may be desired.

Hercules Concrete Blocks in Ireland.

That the concrete block is destined to play an important part in heavy construction in all parts of the world is evidenced by a large order just received by the Century Cement Machine Co., for a number of their Hercules machines to be shipped to Ireland where they will be used in turning out stone 12 inches high by 24 inches long to be used in the construction of a Roman Catholic church to cost over $60,000. This edifice will be built entirely of concrete blocks and when completed will be the largest concrete block structure ever erected in Ireland.

Fine examples of Hercules concrete block construction can be seen in various parts of Ireland. On Chicester street, Belfast, stands a handsome four story concrete block office building erected last season by one of the best known firms in Belfast.

A new line of railroad now under course of construction will have concrete block stations, several Hercules machines having already been received by the contractors having the work in hand.

Bags for Cement and Lime.

The principle on which the Bates valor bag works is so simple that it can not fail and the Bates Valve Bag Co., 5518 Euclid Ave., Cleveland, O., has been most successful in introducing it during the short time since patents were obtained. The salt, plaster, lime and cement trades are a unit in approving of the ease of filling bags by the bag filling machine, and the saving in time and in bags by getting rid of the necessity of tying and untying them. The system is applicable to cloth and paper bags alike. We will give an explanation of the method of operation in a later number.

The Pipe Trade.

The little "Monthly Pipe Parley" issued by the McWane Pipe Works of Lynchburg and Radford, Va., and New York City gives the price for 6-inch pipe in New York and Birmingham at $36 a net ton and in Chicago, $37 to $38. The demand is reported somewhat below the normal but the orders on hand are sufficient to insure good business for the year.

Fire Test of Hollow Concrete Building Blocks.

About two years ago the brick Manix building on the corner of Fifth avenue and Union street in Nashville, Tenn., was burned and as a consequence the walls were condemned by the building inspector and their removal was ordered. The Nashville building department considered very carefully the question of concrete as building material and finally passed an ordinance permitting the use of concrete under rather strict regulation.

The new Montgomery building was constructed on the site of the former Manix building by the Granitoid Construction Co., using concrete blocks made on the system of the American Hydraulic Stone Co., of Denver Col. This system provides hollow walls laid with two rows of blocks properly interlocking and breaking joint and providing large vertical continuous hollow spaces in the wall, connected by smaller staggered horizontal openings between these vertical spaces, so that there is continuous circulation throughout the interior of the wall and no block extends entirely through the wall. The first three stories of the building have 16-inch walls with 50 per cent. of air space and the top story has 12-inch walls with about 40 per cent. air space. The blocks were made of one part Kosmos Portland cement and six parts limestone screenings with a facing of one part of the cement to two parts of granite sand.

The top story and roof were recently

entirely burned out by a fire in the Montgomery furniture house occupying the building, the fire at one time being so hot and so threatening that the firemen were obliged to turn their entire attention to saving the surrounding property. The effect of the fire upon the walls of the building was shown by chipping of window sills and blocks adjacent to the window openings, although they were subjected to the intense heat of the burning stock of furniture for more than an hour and to the many streams of water poured on them during the contest with the flames. The condition of the walls after the fire was satisfactory to the building inspector and the building will be restored simply by replacing, for appearance's sake, the chipped and disfigured blocks about the windows.

The accompanying photograph shows the condition of the building immediately after the fire.

MONTGOMERY BUILDING, NASHVILLE, TENN., AFTER FIRE.
American Hydraulic Stone Company's Hollow Concrete Block Wall.

Creosoted Timber and Its Uses.

The Kettle River Quarries Company of Minneapolis, Minn., has developed as an important branch of its business a creosoting plant in which it treats timbers for all uses, including paving blocks, bridge timbers, railroad cross ties, poles, cross arms, piles, etc. The company has

just issued a handsome booklet, which is full of valuable information upon the subject and is well illustrated with drawings and photographs to help the text.

The reasons for the decay of timber are clearly shown and the value of creosote oil in overcoming the elements of decay and preventing their development is well shown. The treating plant of the company is described, with statement of its adaptation to the kinds of work it may be required to do and illustrations showing details of the plant and the methods of operating it.

The value of creosoted wooden blocks as paving material, and the specifications under which good pavements are secured are fully set forth, including also specifications for the creosote oil. Specifications for pile, tie, and cross-arm timbers and their creosoting are given, with drawings, also specifications for oil seasoning and treatment of timber. The booklet will be sent to interested engineers, city officials and others on application to the Kettle River Quarries Co., Security Bank Building, Minneapolis, Minn.

Trade Notes.

ASPHALT.

Chicago, Ill.—A city asphalt plant is being installed in the municipal warehouse.

Shoshone, Wyo.—The discovery of beds of asphaltum in the Shoshone oil fields, at the eastern base of Copper Mountain is reported.

Williamsport, Pa.—Bids are asked until August 3 for furnishing paving machinery. See Purchase of Machinery.

Burnet, Tex.—Considerable interest is being manifested in the asphalt beds located 1 mile west of town on Post Mountain, and indications point to enormous deposits of asphalt underlying a large portion of the mountain.

Dayton, O.—The contract for constructing an asphalt repair plant was awarded to Hetherington & Berner, of Indianapolis, for $10,500.

Columbus, O.—Special. The contract for constructing an asphalt repair plant was awarded to Hetherington & Berner, of Indianapolis, for $11,825.

BRICK.

Coffeyville, Kas.—The Premier Vitrified Brick & Tile Co., has been incorporated.

Topeka, Kas.—The Topeka Vitrified Brick & Tile Co. has been incorporated by H. S. Andrews, William Moeser, E. B. H. Remley, A. A. Rodgers, F. H. Doster, F. S. Davis, and J. C. Dolman. The company has acquired the plant of the Rogers Brick Works and will remodel and enlarge it.

CEMENT.

Honolulu, Hawaii Islands.—Special. W. W. Harris, vice-president Lewers & Cooke, Ltd., Honolulu, desires information regarding cost, etc., of a modern cement plant of 500 bbls. per day capacity about 30 miles from Honolulu. He also desires names and addresses of appraisers of lime and cement properties.

Catskill, N. Y.—Alsen's American Portland Cement Works of New York has been incorporated here to manufacture Portland cement and other cements and building materials. The directors of the company are Henry E. Mattison, Julius de Vries, New York City; Wm. Muller, Hamburg, Germany; Max Cappus, Emil Mueller, Cornelius Broderson, Catskill; Everett Masten, Yonkers.

Salinas, Cal.—The National Portland Cement Company of California, in which Canadian and San Jose capitalists are interested, is making arrangements to establish a plant near here for the manufacture of cement. This city has given the company 35 acres. The plant will cost $2,500,000.

Batavia, N. Y.—The Panama Portland Cement & Development Co. has been incorporated and has acquired 200 acres of land on the Tombigbee river in Alabama, where it will erect a plant. The officers of the company are: President, C. R. DeMoney, Buffalo, N. Y.; vice-president, James G. R. Cole, Buffalo; secretary, Clarence C. Godfrey, Batavia, N. Y.; treasurer, C. Orvis Brown, Batavia.

Mobile, Ala.—The St. Stephens Cement & Land Co. has been incorporated and will construct a Portland cement plant near St. Stephens, where 1500 acres of cement lands have been bought. The officers of the company are: President, A. S. Lyons; vice-president, F. L. Wadsworth; secretary, S. E. McGlathery; treasurer, J. B. Webster; general manager, W. W. Thompson.

Los Angeles, Cal.—The board of public works awarded a contract, June 19, to the California Portland Cement Co. for 30,000 barrels of cement for use in the early construction of the Owens river aqueduct, at $1.75 a barrel on board cars at Colton.

Alpena, Mich.—The Huron Portland Cement Co. is erecting a plant here. The officers of the company are: President, J. B. Ford; vice-president, E. L. Ford; secretary and treasurer, S. T. Crapo; general manager, H. J. Baxter.

Hooker, Okla.—The Hooker Cement Co. has been organized by Jesse S. Moffit, Francis T. Norbury, and Joseph F. Robinett.

Des Moines, Ia.—The Hawkeye Portland Cement Co. has been incorporated by A. G. Rippey and others.

Valley Park, Mo.—The business men of this town are trying to secure a large cement manufacturing plant, and a company is being formed for the purpose of starting it. The Continental Brick Company and August Heman, of the Heman Construction Co. of this city, are interested.

New Castle, Colo.—The New Castle Portland Cement Co. has been incorporated by Percy C. Conwell, John W. Ritter and Burt Grigon.

Jersey City, N. J.—The Wasatch Portland Cement Co., Jersey City and Salt Lake City, Utah, has been incorporated.

Wellston, O.—The Ohio Cement Co., incorporated under the laws of West Virginia, has broken ground for the erection of a cement plant. The new plant will be located 4½ miles east of this city, on the Detroit, Toledo & Ironton extension, and will have a capacity of 3000 barrels per day.

Cleveland, O.—The Diamond Portland Cement Co. has been incorporated

with Z. W. Davis as president and Lyman A. Reed as secretary.

New Castle, Pa.—This city is in danger of losing the immense plant that the New Castle Portland Cement Co. proposed building here, and it may be built at Rose Point, in the eastern part of the county. The company requested the abandonment of Cascade street, between County Line and Grandview avenue, and the location of the plant depends upon disposition councils make of this request.

Arkansas City, Kas.—The establishment of a cement plant here is being considered by a Mr. Foulke, of Detroit, who is interested in a plant at Bedford, Ind. President Kirkpatrick, of the Commercial Club, appointed A. H. Denton to visit different localities with Mr. Foulke.

Kansas, City Mo.—Special. The Dewey Portland Cement Co., of Coffeyville, Kas., has located its executive general sales office in this city, and the company's address, after Aug. 1, 1907, will be in the Scarritt Building, Kansas City.

Wichita, Kas.—Press reports of July 18 state that the Monarch Portland Cement Co. has been organized for the manufacture of cement in Humbolt, Kas., with headquarters in the Barnes Block, Wichita.

Castalia, O.—Another large Portland cement plant will be established here by Mrs. Anna M. Stentz, who purchased at receiver's sale the entire assets, buildings and machinery of the Toledo Portland Cement company at Manchester, Mich. Owing to the fact that the marl found in the vicinity of the Manchester plant is of an inferior quality, this plant will be removed to Castalia. The name of the company is the Standard Portland Cement Co.

Idaho Falls, Idaho.—The Intermountain Cement & Brick Company has been incorporated and will take over certain lands here and also a patented process for making Portland cement. The officers of the company are: President, John C. Sharp; vice-president, Thomas R. Cutler, Jr.; secretary and treasurer, J. Palmer Sharp.

The new cement factories in California are now in full running order and the price has been reduced to $1.75 at the factory and now compares more favorably with that in other parts of the country.

The reports of merger of the cement companies owning plants in the vicinity of LaSalle, Ill., which have appeared in the daily press and elsewhere were apparently manufactured out of whole cloth as the companies named have all denied any knowledge of the proposed plan, and the supposed promoter of the combination has been equally prompt in his denial. MUNICIPAL ENGINEERING was not deceived by the report and did not print it. This denial is printed to aid the companies, including the Chicago Portland Cement Co., 108 LaSalle street, Chicago, the Marquette Cement Mfg. Co., Marquette Building, Chicago, and the German-American Cement Co., Chicago, in counteracting any effect which the rumore might have.

CONCRETE BLOCKS.

St. Peter, Minn.—John Konsbruck and John Schmidt have engaged in the manufacture of cement water troughs, vaults for coffins, reinforced fence posts, etc.

Webster City, Ia.—C. H. Brown, G. D. Doolittle, and J. M. Kamrar have formed a company to engage in the manufacture of cement products, including pipe and tile, shingles and other articles.

Woonsocket, S. D.—G. O. Kittleson, of Twin Lake township, near here, has purchased a cement block outfit and will engage in the manufacture of blocks.

Valley City, N. D.—W. J. Curren has added a concrete mixer to his cement walk business.

Gilmanton, Wis.—Henry Hurtly has engaged in the concrete block business.

Roseau, Minn.—A large concrete block plant has been established here, by O. B. Ekman.

New York City.—Lunig & Stanis Co. has been incorporated to manufacture concrete blocks by Edward C. Lunig and Mary Lunig, 336 E. 96th street, and Theodore Stanis, 116 Elf street, New York City.

Sheboygan Falls, Wis.—The Sheboygan Falls Concrete Co. has secured the right to manufacture and sell the cement silos patented by Wm. Limberg, of Plymouth, Wis.

Brinkley, Ark.—The Brinkley Concrete Block & Paving Co. has been organized with officers as follows: President, D. S. Coleman; secretary, James Shults; treasurer, Frank Andrews.

Paris, Tex.—The Paris Concrete Mfg. Co. has purchased a site and will erect a plant for the manufacture of concrete blocks.

Canton, O.—The Laughlin Sandstone Brick & Cement Co. has been incorporated by John L. Robb and associates.

Camden, Tenn.—T. W. Sanders will build a plant for the manufacture of concrete blocks.

Uvalde, Tex.—J. H. Gearhart will establish a concrete block and brick plant.

Devine, Tex.—Frank Kempf and Emil Liepold will install machinery for the manufacture of cement building blocks.

Camden, N. J.—The Concrete Construction Co. has been incorporated by F. J. Foreman, Albert Parson Hall, Jr., John M. Weidenfeller, and Wm. H. McClain.

Rusk, Tex.—W. J. Burke will establish a concrete block plant.

Des Moines, Ia.—The Enamel Concrete Co. may engage in the manufacture of grinding mills for concrete work, involving a new method.

McLean, N. D.—John Tenney and J. Herzog will engage in the manufacture of cement blocks.

Kendallville, Ind.—The Raber-Wiltrout-Lang Co. has been organized to manufacture cement tile.

Salem, O.—The Standard Sand & Concrete Co. has been incorporated by H. W. Williamson, C. B. Hunt, D. E. Mather, Wm. Deems and Richard Cole.

Chehalis, Wash.—A concrete block and brick plant has been established by John West.

Bancroft, Ia.—A company has been organized here to make cement drain tile. Address mayor for names of interested parties.

Cleveland, O.—The Wing Concrete Block Co. has been incorporated by John E. Wing, George O. Wing, Sherman J. Wing, Owen W. Wilcox and John D. Fachler.

Chattanooga, Tenn.—The Ferro Concrete Construction Co. has been organized to do general concrete work, lay

mosaic floors, etc., by James E. Lawton, president, and R. E. Telford, secretary and treasurer. Offices, 732 Georgia avenue.

Hanska, Minn.—The Atlas Concrete Works has been organized, with Gudman Anderson as president.

Buffalo, N. Y.—The New York Concrete Wall Machine Co. has been incorporated by Samuel B. Simpkins, Harvey W. Putnam, Samuel A. Williams, Fred F. Emerson, and William N. Schumer, all of Buffalo, except Mr. Williams, who is from New York City.

Woodward, Okla.—The Woodward Cement & Concrete Co. has been incorporated by S. B. Laune, E. P. Burdick, and A. Van Pelt.

Richmond, Ind.—The American Concrete Pole Co. has been organized here by James A. Brailey, of Toledo, O.; Wm. Bailey, the inventor of the pole; W. P. Orr, S. K. Stotler, L. M. Flesh, of Piqua, O.; A. C. Lindemuth, John M. Lontz, Edwin H. Cates, LeRoy E. Browne, of Richmond.

O'Keene, Okla.—The Cement Products Co., of Minneapolis and O'Keene has been incorporated by C. F. Haglin, H. N. Lighton and E. G. Potter, of Minneapolis; H. H. Dohe and H. E. Wilson, of O'Keene.

Rock Island, Ill.—A petition has been filed in the federal court asking for the appointment of a receiver to take charge of the affairs of the Concrete Construction Co. of this city.

Wilson, Okla.—The Cement Products Co. has been organized by H. E. Wilson of this city, and C. F. Haglin, E. G. Potter, Alexander Campbell and H. N. Leighton, of Minneapolis, for the manufacture of cement and cement products.

Yankton, S. D.—The Western Portland Cement Co. has established a cement post factory at its plant.

Isanti, Minn.—John Swelander and Nic Hedberg have purchased a concrete block outfit.

PURCHASE OF MACHINERY.

Austin, Minn.—Special. F. I. Crane advises us that he is in the market for a hand-power mixer and a cheap block machine making 16x24 inch blocks 8x12 inch cores.

Williamsport, Pa.—Bids are asked until August 3 for furnishing and delivering paving machinery as follows: One 20-H. P. boiler and fittings; 15-H. P. engine and fittings steam jacketed asphalt mixed; fire wagon, to heat asphalt tools; portable asphalt melting kettle; and drier; 7 or 8-ton tande masphalt roller. J. J. Galbraith, cy. clk.; Jas. F. Fisher, cy. engr.

Philadelphia, Pa.—Special. James A. Brown, 8057 Moss street, Holmesburg, Philadelphia, is in the market for rock crushers, concrete mixers and cement machinery.

Binghamton, N. Y.—Special. Stephen Flanaghan & Son, Hotel Bennett, desire to rent a Potter trench machine.

Sioux Falls, S. D.—Special. P. F. Connolly desires prices on asphalt rollers.

PURCHASE OF MATERIALS.

Red Wing, Minn.—Special. The Lillyblad-Nelson Construction Co. is in the market for Portland cement and crushed stone.

Sioux Falls, S. D.—Special. P. F. Connolly desires prices and samples of vitrified brick for paving from three or four concerns.

MISCELLANEOUS.

Chicago, Ill.—Robert W. Rust & Company, general offices, 1121 Rookery Bldg., have been given the inspection of the material for the Southern Pacific Company's rifled pipe line. This embraces 256 miles of 8-inch rifled pipe, which is being manufactured at the Lorain plant of the National Tube Co., and the machinery for 24 pumping stations, covering 46 duplicate pumps to be manufactured by the Janesville Iron Works, Hazleton, Pa., and 72 boilers to be furnished by the Edgemoor Iron Co., Edgemoor, Del.

SEWER PIPE.

Lehigh, Ia.—The Lehigh Sewer Pipe & Tile Co. has been incorporated and will erect a 24-kiln plant. The officers of the company will be at Fort Dodge. The officers are: President, E. J. Breen, vice-president, J. D. Spaulding, Sioux City; secretary, G. A. Lyon, Estherville; treasurer, Chas. Larrabee, Fort Dodge.

Patents Concerning Cement and Its Uses.

839,053. Rotary Kiln. Wm. R. Warren, New York, N. Y.

12,578 (reissue). Machine for Manufacturing Hollow Concrete Building Blocks. Frank A. Borst, South Bend, and John Groscop, Auburn, Ind.

12,580 (reissue). Flask for Molding Concrete Blocks. John Hamm, Minneapolis, Minn.

839,092. Combination Concrete Block and Brick Machine. Wm. S. Barker, Dayton, O.

839,125. Molding Machine. Walter Dyer, Chicago, Ill.

839,151. Composite Pole for Electric Wires and Other Purposes. Eugene M. Johnson, Allston, Mass.

839,178. Machine for Molding Fence Posts. Marshall C. Munn, Lee, Ill.

839,184. Railway Track Construction. Henry B. Nichols and Geo. B. Taylor, Philadelphia, Pa.

839,272. Cement Pole. Anderson G. Crow, Murphysboro, Ill.

839,388. Machine for Making Concrete Building Blocks. Julius Jaeger, Rutherford, N. J.

839,418. Cement Block Machine. Britton Poulson, Ft. Wayne, Ind.

839,419. Molding Machine. Lewis M. Pratt, Belleville, Kan.

839,496. Concrete Wall Building Device. Jas. Milam, Kansas City, Kan.

839,510. Artificial Building Stone Block. Emanuel J. Propper and Ferdinand Bachschmid, Biel, Switzerland.

839,600. Cement Paving. Robert Kieserling, Altona, Germany.

839,650. Manufacture of Building Blocks. John Sands, Oakland, Cal.

839,667. Machine for Making Concrete Walls. Alexander J. Stoeser, Chicago, Ill.

839,668. Machine for Molding Walls, etc. Alex. J. Stoeser, Chicago, Ill.

839,702. Composite Railway Tie. Felix J. Baivier, Velva, N. D.

839,722. Combination for and the Process of Manufacturing Artificial Stone. Emile T. Bundsmann, Point Loma, Cal.

839,730. Frame or Reinforcement for Concrete Railroad Sleepers. Pierece Chandy, Paris, France.

839,782. Concrete Molding Apparatus. A. A. Pauly and David Heinselman, Youngstown, O.

12,586 (reissue). Cement Pipe Mold. Levi Shell, Sibley, Iowa.

Patents Concerning Clean Streets and City Refuse Disposal.

788,002. Dumping Wagon. David D. Watson, Canastota, N. Y.

788,958. Garbage Bag. Wm. J. Smith, McKeesport, Pa.

789,329. Garbage Furnace. Eugene J. Little and Daniel C. Shaw, Toledo, O.

791,206. Street Sweeper. Jere A. Paige, Manchester, N. H.

792,351. Sweeper. Clarence B. Ryan, Pittsburg. Pa.

792,545. Street Cleaner. Edwin G. Mcwaner, Pittsburg, Pa.

794,471. Portable Garbage Crematory. Isaac D. Smead, Cincinnati, O.

795,059. Street Flushing Machine. Leopold F. Ottoby, St. Louis, Mo.

796,544. Garbage Cremator. Wm. D. Walters, Chicago, Ill.

799,040. Flap for Closing the Lateral Openings of Dust Carts. Heinrich Freise, Hamme, near Bochum, Germany.

799,126. Combined Street Sweeper and Collector. John T. Whittome, Tavistock, Eng.

800,177. Combined Crematory and Latrine. Fred P. Smith, New York, N. Y.

800,178. Portable Crematory. Fred P. Smith, New York, N. Y.

801,392. Garbage Receptacle. John H. Meyerhofer, Jr., Toledo, O.

802,682. Street Sweeping Machine. Charles W. Collyer, Randolph, Mass.

803,632. Composition for Laying and Absorbing Dust. Berthold Singer, Chicago, Ill.

803,650. Refuse Burner. Fredk. G. Wiselogel, Indianapolis, Ind.

805,256. Garbage Incinerator. Jos. G. Branch, St. Louis, Mo.

805,452. 805,453. Garbage Bag. Edward J. Deegan and Chas. H. Propper, New York, N. Y.

806,378. Automobile Street Sprinkler. John J. Sullivan, Chicago, Ill.

806,885. Garbage or Ash Can. Geo. Focht, Hoboken, N. J.

807,126. Oleaginous Mixture for Sprinkling on Road, etc. Chas. V. Potter, Balwyn, Australia.

807,889. System for the Destruction of Refuse. Geo. Watson, Pori, near Leeds, and Henry W. Mason, Wakefield, Eng.

808,006. Rotary Brush for Street Sweepers and the Like. Chas. H. Butler, Oakland, Cal.

808,352. Street Cleaner (Pneumatic). Holmes Duke, Beaumont, Tex.

808,739. Street Sweeper's Cart. Geo. Focht, Hoboken, N. J.

810,362 Street Cleaning Apparatus. Napoleon St. Peter, Jr., Fairfield, Me.

810,684. Dumping Wagon. Green R. Starnes, Charlotte, N. C.

813,389. Process for the Prevention and Laying of Dust on Roads, etc. Wm. M. Sanderson, Ashfield Ayton, Scotland.

813,544. Street Sweeper. Chas. M. Eaves, John W. Slaven, and Geo. W. Wade, Galesburg, Ill.

814,563. Garbage Can, Ezra S. Pond, Toledo, O.

816,082. Road Sweeper. Chas. J. Ewart, Roscoe, N. Y.

816,606. Street Cleaner. Jas. G. Sanderson, Scranton, Pa.

817,662. Street Cleaning Machine. Ellis S. Pearson, Bradford, O.

819,178. Street Sweeper. Peter A. Sheley, Louisville, Ky.

819,728. Street Sweeping Machine. Jas. P. Clark, Dallas, Tex.

821,152. Means to Sprinkle Crude Oil on Dusty Roads. John F. Blunt, Los Angeles, Cal.

824,891. Ash and Garbage Can. Casper Van Hoesen, New York, N. Y.

827,617. Refuse Reduction Machine. Douglas P. Carritte, New York, N. Y.

838,643. Method of and Agent for Laying Dust. Clinton E. Dolbear, Longbeach, Cal.

829,954, 829,955. Process of and Apparatus for Reducing Garbage and Sewage. Eugene R. Edson, Cleveland, O.

830,027. Garbage Crematory. Wm. M. Venable, New York City.

830,490. Street Cleaning Machine. Horace Borden, New Bedford, Mass.

831,470. Street Cleaner's Truck. John Rehm and Theodor von Gerichten, New York, N. Y.

835,699. Garbage Furnace. Benjamin Boulger, New York, N. Y.

836,330. Garbage Furnace. Wm. F. Morse, New York, N. Y.

838,107. Street Sprinkler. Joseph B. Hall, Chicago, Ill.

838,804. Garbage Receptacle and Cover. Jacob I. Orkin, Boston, Mass.

839,270. Garbage Incinerating Apparatus. Geo. R. Cottrell, Tottenville, N. Y.

839,588. Garbage Can. Isaac Horsohn, New York, N. Y.

839,823. Street Cleaning Machine. Frederick Ebner, La Crosse, Wis.

842,365. Sanitary Dump Wagon. Frederick G. Wiselogel, Indianapolis, Ind.

Patents Concerning Roads and Pavements.

788,582. Heater for Repairing Bituminous and Asphalt Pavements. Geo. H. Fairchild and Richard R. Pierson, San Francisco, Cal.

788,751. Paving Rammer. Wayne A. Childrey, Richmond, Va.

789,603. Machine for Making and Repairing Roads. Stuart E. Freeman, Barberton, O.

790,932. Asphaltic Composition. John B. Swindle, Ardmore, Ind. Ter.

791,013. Supporting and Strain Device for Electric Railways. Harry P. Davis and Theodore Varney, Pittsburg, Pa.

791,137. Pavement. Frank E. Cudell, Cleveland, O.

791,726. Apparatus for Spreading Bitumen or Material of a Similar Character. August E. Schutte, Boston, Mass.

791,789. Road Scraper. Clifton S. Hunt, Madre, Ind.

791,937. Road Machine. Ira F. Noble, Graettinger, Iowa.

791,960. Manufacture of Bituminous Compositions or Pitches. Frederick J. Warren, Newton, Mass.

792,873. Construction of Bituminous Macadam or Other Pitch Pavements. Joseph H. Armies, Philadelphia, Pa.

794,758. Wooden Block for Pavements. Fred J. and Ralph L. Warren and Frank G. Cutter, Boston, Mass.

795,655. Wheeled Scraper. Charles H. Sawyer, Minneapolis, Minn.

795,728. Road Grading and Ditching Machine. Helmer Ogard, Ada, Minn.

795,905. Means for Removing Asphalt Paving. John Gammie, New York, N. Y.

796,186. Oiled-Road Roller, Kneader and Packer. Alfred E. Burns, Los Angeles, Cal.

797,356. Railway Paving Plant. Frederick A. Hetherington, Indianapolis, Ind.

797,408. Pavement. Geo. W. Crichfield, Jersey City, N. J., and W. T. S. Crichfield, New York, N. Y.

799,014. Apparatus for Repairing Asphalt Pavements. John H. Morcom, Denver, Col.

799,250. Road Scraper. Robert M. Milling, Plantersville, Ala.

799,619. Bituminous Pavement, Fred. J. Warren, Newton, Mass.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Chehalis, Wash.—Brick and macadam paving is proposed.

Iowa City, Ia.—Paving is proposed for several streets.

Toledo, O.—The paving of Phillips avenue is contemplated.

St. Cloud, Minn.—Council contemplates paving the street.

New Britain, Conn.—The paving of Church st. is contemplated.

Fernandina, Fla.—Vitrified brick is contemplated for Center st.

Duluth, Minn.—Paving is contemplated for 3d st. and 29th ave. W.

Brookston, Minn.—Council contemplates having all the graded streets paved.

Faribault, Minn.—Council is considering the question of paving the business streets.

Rockford, Ill.—Petitions are being circulated for repaving the business streets with aspaalt.

Bristol, R. I.—Plan are being formulated for the improvement of Asylum road by macadamizing.

Durham, N. C.—Special. Gilbert C. White, C. E., desires catalogues of specialties for streets.

Lorain, O.—A resolution has been passed for paving Franklin st. from Broadway to Oberlin ave.

Lansing, Mich.—Council adopted a resolution, July 15, to pave Washington ave. Cy. engr. Collar.

Aurora, Ill.—Petitions are being circulated asking for asphalt and brick paving on a number of streets.

Toledo, O.—The property owners on 19th and Huron sts., have petitioned council to repave those thoroughfares.

Lincoln, Ill.—The board of local improvements has adopted estimates of the cost of repaving Kickapoo st.

Omaha, Neb.—The repaving of a number of streets in the business portion of this city is proposed by acting Mayor Johnson.

Argentine, Kas.—Council has passed a resolution to pave all streets on which street cars are to run, with asphalt.

Greeneville, Tenn.—The county court of Greene county has ordered the issuance of $100,000 bonds for road purposes.

Rensselaer, N. Y.—The county board of supervisors has decided to macadmize the road from this city to De Freesville.

Dowagiac, Mich.—A resolution has been passed providing for the grading and paving of Main st. H. L. Rutter, cy. clk.

Redfield, S. D.—An ordinance has been passed providing for the construction of cement sidewalks. Dr. H. C. Burch, mayor.

Barbourville, Ky.—A macadamized road will be constructed from this city to Manchester, at an etimated cost of $36,000.

Vincennes, Ind.—The construction of concrete sidewalks and stone curbing on St. Clair and Sycamore sts., is contemplated.

Jacksboro, Tenn.—The Campbell county court has adopted a resolution to issue $100,000 bonds to build additional pike roads.

Lowell, Mass.—Block paving is contemplated for Central st. and smooth paving for Paige, John and Westford sts.

Troy, N. Y.—The board of supervisors has passed a resolution to construct the Reservoir-Sycaway road in Center Brunswick.

Bloomington, Ill.—City Engineer Fauntz is in favor of adopting asphalt filler for all brick pavements constructed in the future.

Allegheny, Pa.—Council has passed ordinances for paving Latrobe alley, Frazier and Warner sts., Motive, Juno, and Ramage Alleys.

New Orleans, La.—The streets and landings com. has reported favorably on ordinances providing for the paving of a number of streets.

Decatur, Ill.—An ordinance has been passed for paving W. William st. with vitrified brick on concrete base, with asphalt filler.

Chester, Pa.—Resolutions have been passed providing for the paving of Crosby and Parker sts., and curbing and walks on Central ave., 8th and Lloyd sts.

St. Joseph, Mich.—Resolutions have been adopted for paving Board and Main sts. and Niles ave. with brick. Objections will be heard Aug. 7. Cy. engr. Cleary.

Canton, S. D.—An ordinance has been passed providing for the construction of cement sidewalks within the corporation limits of the city. W. C. Gemmill, mayor.

Gary, Ind.—The construction of 4000-ft. of brick paving on sand foundation with concrete curbing on Madison st., from 9th to 19th aves. is contemplated by the town board.

Bloomington, Ill.—An ordinance has been passed providing for asphalt paving for Clinton, Emerson, and Graham sts. The resurfacing of East st. with asjhalt is contemplated. Cy. clk. Rhoads.

Great Falls, Mont.—This city has annulled the contract for paving Central ave. with brick, and plans and specifications are now being prepared for creosoted block paving. C. W. Swearingen, cy. engr.

Champaign, Ill.—G. C. Fairclo, cy. engr. has prepared plans and specifications for paving Daniels st. with asphalt, and bids will be asked about Aug. 1. Plans are also being prepared for paving Chalmers st. with brick.

St. Louis, Mo.—The state board of agriculture has appointed Curtis Hill, of this city, an engineer to draw up plans for a roadway 60 feet wide, to be macadamized with limestone, to

connect this city with Kansas City, Mo.

Ottumwa, Ia.—Special. J. T. Brady, cy. engr., says bids will be received in August for 7000 sq. yds of brick on 6-in. crushed stone base, and 5200-lin. ft. of cement curb. Other paving is also contemplated during the year.

Butte, Mont. — Special.—Alexander Leggatt, cy. engr., advises us that this city will probably do some paving this summer, and he wants samples and data of paving material, particularly adapted to stand heavy traffic on steep grades.

Colorado Springs, Col.—The real estate men have approved the report of the special paving committee on paving and formally recommended to the property owners that bitulithic paving be constructed on the business streets of this city.

Clinton, Tenn.—The Anderson county court has endorsed the $100,000 pike road bond proposition. J. K. P. Wallace, of Andersonville, was elected chairman, W. L. Owen, of Clinton, secretary and Levi Forster, of Robertsville, associate member of the commission.

Columbia, S. C.—At a meeting of councils July 11, city engineer Chisholm submitted plans for bitulithic, cement, concrete and vitrified brick for paving Main st. After much discussion it was decided to ask an experienced engineer to recommend a number of experts to submit plans on all materials.

Collinsville, Ill.—Special. A. C. Powell, cy. eng. says this city contemplates paving about 75,000-sq. yds. of streets in the near future with brick on 4-in. concrete base, with natural stone curbing. Mr. Powell desires quotations on materials in different quantities up to the maximum f. o. b. this city so that he may be able to furnish an estimate in amounts of 25, 50 and 100 per cent. of the 75,000-sq. yds.

East Chicago, Ind.—This city contemplates paving 4 streets.

Fergus Falls, Minn.—An ordinance has passed first reading for constructing cement sidewalks.

Webb City, Mo.—A resolution has been passed for constructing cement sidewalks and macadam on Madison st.

CONTRACTS TO BE LET.

Napoleon, O.—Bids are asked until Aug. 6 for road improvements. F. J. Beck, co. oudt.

Bloomington, Ind.—Bids are asked until Aug. 6 for improving Hunter ave. Cy. engr. Hanna.

Greenville, O.—Bids are asked until Aug. 3 for the New York road improvement. Jos. E. Marker, co. surv.

New Bremen, O.—Sealed bids are asked until Aug. 3 for paving several streets. A. M. Steunebrey, vil. clk.

Hayfield, Minn.—Bids are asked until Aug. 5 for 2025-sq. ft. of cement walks. E. C. Hellekson, vil. recdr.

Crawfordsville, Ind.—Bids will be received Aug. 19 for paving Wabash and Pine sts. H. B. Hulett, cy clk.

Washington, Ind.—Sealed bids are asked until Aug. 6 for graveling a number of roads. Thos. Nugent, co. audt.

Versailles, Ind.—Sealed bids are asked until Aug. 6 for constructing macadam roads. Nicholas Volz, co. audt.

Stevens Point, Wis.—Bids are asked until Aug. 3 for macadamizing, curbing and guttering Strongs ave. B. P. W.

St. Cloud, Minn.—Bids are asked until Aug. 5 for constructing concrete crosswalks. Barney Vossberg, cy. clk.

Toledo, O.—Sealed bids are asked until Aug. 5 for repairing the Dorr st. stone road. D. T. Davies, Jr., co. audt.

Brazil, Ind.—Sealed bids are asked until Aug. 6 for constructing a gravel road in Lewis twp. Jas. L. Burns, co. audt.

Reynoldsville, Pa.—Bids are asked until Aug. 6 for grading, curbing and paving Swamp Alley. J. C. King, prest. town coun.

Carlinville, Ill.—Bids are asked until Aug. 5 for constructing brick street crossings. David Johnston, cy. clk.

Bloomington, Ind.—Bids are asked until Aug. 6 for constructing 11,200-ft. of road in Clear Creek twp. S. M. Kerr, co. audt.

Struthers, O.—Sealed bids are asked until Aug. 10 for constructing crosswalks and grading Lowellville ave. C. Creed, vil. clk.

Terre Haute, Ind.—Bids are asked until Aug. 3 for constructing 10,620-ft. of gravel road in Prairie twp. J. W. Denehie, co. audt.

Montpelier, Ind.—Sealed bids are asked until Aug. 8 for constructing the Neal macadam road in Harrison twp. L. W. Daugherty, co audt.

Steubenville, O.—Sealed bids are asked until Aug. 19 for paving 7th st. from Logan to Ross, with brick. T. W. Vance, clk. B. P. S.

Boonville, Ind.—Bids are asked until Aug. 5 for grading, draining and paving roads, 3, 4, 5 and 6, Campbell twp. Ray F. Cheny, co. audt.

Covington, Ind.—Bids are asked until Aug. 6 for constructing about 10-mls. of gravel roads, in 5 separate contracts. W. B. Gray, co, audt.

Celina, O.—Sealed bids are asked until Aug. 10 for grading, graveling and macadamizing Romer and Jones road improvements. M. Lutz, co. engr.

Two Rivers, Wis.—Sealed bids are asked Aug. 9 for grading, graveling, macadamizing and curbing Williams st. John Gesell chmn. B. P. W.

Peru, Ind.—Bids are asked until Aug. 7 for grading, draining and paving 23½ mls. of free gravel roads in Richland twp. Chas. Griswold, co. audt.

Rockville, Ind.—Sealed bids are asked until Aug. 7 for constructing a number of gravel roads. T. A. Garrardi, chmn. co. comrs H. A. Henderson, co. audt.

Ft. Mackenzie, Wyo.—Bids are asked until Aug. 5 for constructing cement sidewalks, steps, and road crossings at this post. Capt. Wm. D. Davis, Q. M.

Columbus, Ind.—Sealed bids are asked until Aug. 5 for constructing 1½-mi. of road in Clifty twp. W. O. Clark, chmn. co. cmrs.; John M. Davis, co. audt.

Glenwood, Ind.—Bids are asked until Aug. 15 for constructing about 30,000-sq. ft. of cement sidewalk. Esty Reyburn prest. bd.; Karl L. Hanson, engr., Connersville.

Somers Point, N. J.—Bids are asked until 8 p. m. Aug. 5 for grading and graveling Harbor Lane and building a bulkhead or wharf on Harbor Lane. James E. Scull, cy. clk.

Fargo, N. D.—Sealed bids are asked until 5 p. m. Aug. 5 for paving N. P. ave. with creosoted cedar blocks and vitrified brick on concrete base. S. F. Crabbe, cy. engr.

Washington, Pa.—Bid are asked until Aug. 6 for improving roadbeds, culverts, etc., on certain highways, aggregating about 13-mis. Wm. Wylie, co. road engr. for comrs.

Olympia, Wash.—Bids are asked until Aug. 5 for paving Main st. with brick, asphalt or other approved material; ½-mi. concrete curb and gutter; 2000-lin. ft. storm sewer.

Cedar Rapids, Ia.—Bids are asked until Aug. 12 for constructing 1000-ft. of curbing and 2500-sq. ft. of cement sidewalk at the VanBuren and Harrison Schools. J. M. Inhold, secy.

Monessen, Pa.—Sealed bids are asked until Aug. 9 for grading, curbing and 17,500-sq. yds. of vitrified block paving. W. A. Miller, chmn. st. and roads com.; J. F. Irwin, boro. engr.

Skowhegan, Me.—Bids are asked until Aug. 5 for constructing a highway from the Forks to Lake Moxie Station. Co. comrs.

Concord, N. H.—Bids are asked until Aug. 8 for constructing trap rock and gravel highways. A. W. Dean, state engr.

New York City.—Bids are asked until Aug. 6 for asphalt paving on the approach to the Stapleton Ferry terminal at Staten Island. J. A. Bensel, comr. docks. Bids are asked until Aug. 8 for constructing asphalt tile walks in certain parks in Brooklyn, and until Aug. 3 for furnishing broken stone for trap rock and screenings of trap rock for certain parks. Moses Herrman, prest. park dept.

Riverton, N. J.—Bids are asked until Aug. 8 for 30,000-sq. yds of cement paving, and grading and graveling or sodding about 800-sq. yds of sidewalks. Edward H. Pancoast, chmn highway com.

Montgomery, Ala.—Bids are asked until Aug. 5 for constructing sidewalks, curbs, etc. R. S. Williams, cy. treas.

Martinsville, Ind.—Bids are asked until Aug. 6 for constructing a gravel or macadam road. R. E. Thornburg, co. audt.

Huntington, Ind.—Bids are asked until Aug. 13 for brick paving and stone curbing on S. Jefferson st. and cement sidewalks on Whitelock st. J. B. Vernon, cy. engr.

Edgewater, N. J.—Bids are asked until Aug. 6 for improving to the River Road, in the Shadyside section. Watson G. Clark, boro engr., 1125 Broadway, N. Y. City.

Cleveland Heights, O.—Bids are asked until Aug. 20 for constructing sidewalks and macadam paving on Fairmont boulevard. W. G. Phare, vil. clk., 204 Am. Trust Bldg., Cleveland; F. A. Pease Engrg Co., cons. engrs., 931 Williamson Bldg., Cleveland.

Devil's Lake, Minn.—Bids are asked until Sept. 1 for grading certain streets. Mayor.

Elizabeth, N. J.—Bids are asked until Aug. 15 for constructing new curbing. Cy. coun.

Mt. Vernon, Ind.—Sealed bids are asked until Aug. 5 for constructing nearly 22-mis. of gravel roads, in 10 separate contracts. Robt. W. Highman, chmn. co. cmrs.; Silas G. Howard, co. audt.

Plainfield, N. J.—Sealed bids are asked until Aug. 5 for 15,792-sq. yds. of brick paving, 1035-ft. new curb, and 1400-ft. curb reset. Geo. B. Wean, cy. clk. pro tem.; A. J. Gavett, cy. engr.

Sharpsville, Pa.—Sealed bids are asked until 7 p. m. Aug. 6 for paving 11,700-sq. yds. of Main and Walnut sts. with vitrified paving block on 6-in. concrete base and asphalt filler. W. A. Graber, boro. secy.

Spencer, Ind.—Bids are asked until Aug. 5 for constructing 1-mi. of pike road in Clay twp. and 1½-mi in Taylor twp.; until Aug. 6 for constructing 6176-ft. in Jennings twp. Geo. O. Mitten, co. audt.

Columbus, O.—Sealed bids are asked until Aug. 3 for constructing 2 highways at St. Clairsville, Belmont co.; until Aug. 10 for brick construction at Lisbon, Columbiana co. Sam Huston, State highway comr.

Somers Point, N. J.—Sealed bids are asked until Aug. 5 for constructing 11,928-sq. yds. of macadam driveway on Main ave., 6285-ft. new blue stone curbing, resetting 1365-ft. old curb, and 56-ft. radius curb. James E. Scull, cy. clk.

CONTRACTS AWARDED.

Terre Haute, Ind.—The Meredith Construction Co. secured the contract for paving Kent ave.

Wadsworth, O.—The contract for paving Main st. was awarded to P. T. McCourt, of Akron.

Averyville, Ill.—The contract for constructing sidewalks on Parke ave. was awarded to Jassen & Son.

Seattle, Wash.—The Ranier Development Co. was awarded the contract for regrading 3d ave. for $980,526.

Toledo, O.—Henry Streicher was awarded the contract for paving Irving st. with asphalt, for $12,737.70.

Lansing, Mich.—Martin E. Fitzpatrick was awarded the contract for paving South st., July 8, for $5,992.

Quincy, Ill.—Henry Rees was awarded the contract for paving 2d st. with brick, at $1.47¼ a sq. yd.

Superior, Wis.—The contract for constructing several blocks of cement walks was awarded to Alexander Sang.

Clinton, Ind.—The contract for paving 5 blocks of Main st. was awarded to Harris & Dorsey, of Terre Haute.

Charleston, Ill.—The contract for paving Jackson st. was awarded to Geo. W. Brewer, of this city, for $7,768.

Mayfield, Ky.—Chas. B. Quinn was awarded the contract for paving Broadway with brick, at $1.98½ a sq. yd.

Goshen, Ind.—The contract for paving W. Lincoln ave. with vitrified brick was awarded to Klopfenstein & Himebaugh.

Greensburg, Pa.—The contract for paving a number of streets was awarded to James F. Dixon & Bro., of Blairsville.

Bryan, O.—The contract for macadamizing a road in Brady twp. was awarded to Crawford & Spratt, of Toledo, for $7,517.

Providence, R. I., has awarded a contract for 21,000 sq. yds of bitulithic to Warren Brothers Company of Boston.

Wooster, O.—The contract for paving Bever st. with brick was awarded to Shannon & Wildeson, of Orrville, at $1.51 a sq. yd.

New Bedford, Mass.—An additional contract for 8,000 sq. yds. of bitulithic has been awarded the Warren Brothers Company of Boston, Mass.

Herkimer, N. Y., has added 5,675 sq. yds. of bitulithic to the contract prev-

iously awarded Warren Brothers Company of Boston.

Decatur, Ia.—The contract for constructing 8-mis. of cement sidewalks was awarded to the Columbus Concrete Co., of Columbus, Miss.

Sauk Rapids, Minn.—The contract for constructing new tile sidewalks was awarded to the Henning Sidewalk Co., of East St. Louis, Ill.

Neenah, Wis.—The Green Bay Concrete Co. was awarded the contract, July 13, for paving N. Commercial st. with brick, for $15,969.05.

Laramie, Wyo.—William Birnie was awarded the contract for constructing cement sidewalks in front of the city hall and engine house.

Milwaukee, Wis.—The contract for paving Jefferson st. with asphalt was awarded to the Barber Asphalt Paving Co., at $1.78 a sq. yd.

Dubuque, Ia.—The contract for paving 9th, 11th and 13th sts., with brick was awarded to the McCarthy Improvement Co., of Davenport.

St. Paul, Minn.—The contract for resurfacing St. Peter st. with asphalt was awarded to the Barber Asphalt Paving Co., for $22,503.40.

McKees Rock, Pa.—Booth & Flinn, of Pittsburg, were awarded the contract for raising the grade of Charters ave. for 8 blocks westward.

Murphysboro, Ill.—The contract for paving 27 blocks of streets in this city was awarded to Hill & Gaynord, of East St. Louis, Ill., for $50,000.

Crawfordsville, Ind.—The contract for improving the Mat Young et al., road was awarded, July 20, to Clements & Clements of this city, for $6,697.

Appalachia, Va.—The contract for constructing sidewalks and macadam streets was awarded to C. R. Scharf & Co., of Bristol, Va.-Tenn., for $8,000.

Ironwood, Mich.—The contract for constructing 40,000-sq. ft. of concrete sidewalks was awarded to W. H. Newberry, of Newberry, Mich., for $12,412.

Toronto, Ont., has awarded a contract for 2,614 sq. yds. of bitulithic to the Warren Bituminous Paving Company of that city.

Grafton, W. Va.—Contracts for curbing and grading Barrett st., in South Grafton, were awarded, July 8, to L. L. Butcher and J. M. Keane, local contractors.

Huntington, Tenn.—The contract for graveling streets and public square was awarded to the Perryville Gravel & Ballast Co., of Perryville, Tenn., for $10,000.

Chatham, Ont.—The Warren Bituminous Paving Company of Toronto, Ont. has received a contract for 7,900 sq. yds. of bitulithic.

Marshall, Texas.—The Texas Bitulithic Company of Dallas, Texas has been awarded a contract for 27,684 sq. yds. of bitulithic.

Independence, Mo.—The Kansas Bitulithic Company of Kansas City, Mo., has been awarded a contract for 9,350 q. yds. of bithulithic.

Ashland, Ky.—A contract for 15,716 s. yds. of brick paving has been awarded to the Southern Bitulithic Company of Nashville, Tenn.

Asheville, N. C.—The Atlantic Bitulithic Company of Richmond, Va., has been awarded a contract for 4,203 sq. yds. of bitulithic.

Chicago, Ill.—The contract for paving the School st. system with asphalt was awarded July 23, to Joseph Hanratty, for $96,531.

San Diego, Cal.—The Western Paving Co. was awarded a contract for paving National ave. for $18,335.48, and the Barber Asphalt Paving Co. secured the contracts as follows: 7th st., $37,-823.19; 16th st., $12,791; Logan ave., $22,004.24; C. st., $21,794.53; 26th st., $3,132.04.

Wauseon, O.—G. R. Heffner & Son secured the contract for paving as follows: Depot st., $10,596.90; Beech st., $2,665.21; Commercial st., $9,229.51.

Norwalk, O.—The contract for paving Rochester and Clarksfield sts. and Railroad ave. was awarded to the Bluffton Stone Co., for $29,418.41.

Calumet, Mich.—The contract for contructing concrete sidewalks, gutters and curbing was awarded to William Kilbride & Co., of Bessemer, Mich., for $2,526.

Nappanee, Ind.—The contract for constructing brick street paving in this city was awarded to the Central Construction Co., of Rochester, Ind., for $100,000.

Hillsboro, Ind.—The contract for paving ½ mi. of the main street in this city with vitrified brick was awarded July 8, to Nolan & Slattery, of Crawfordsville.

Ft. Snelling, Minn.—The contract for constructing the military road through the Ft. Snelling reservation was awarded to D. W. Moore, of St. Paul, for $4,735.

Ft. Riley, Kas.—The contract for constructing 15,000 sq. ft. of cement sidewalks was awarded to W. J. Lott of Junction City, Kas., at 18½ cts. a sq. ft.

Moravia, N. Y.—The contract for paving Central st. was awarded to S. P. Hull, of Cortland, N. Y., for $11,045.

Seattle, Wash.—Contracts have been awarded as follows: Grading and curbing Greenwood ave., J. S. Holt, $115,-958; cement walks in E. Gales st., Paul Steenstrup, $4,680; grading and curbing 34th st., International Contract Co., $10,474.

Yonkers, N. Y.—A contract for 10,000 sq. yds. of Acme asphalt has been awarded the Warren Asphalt Paving Company of Combridge, Mass.

Rochester, N. Y.—Warren Brothers Company of Boston, Mass. will pave Lake View avenue. The contract calls for 21,500 sq. yds. of bitulithic.

Baltimore, Bd is adding 1,740 sq. yds. of bitulithic to the contracts previously awarded. Warren Brothers Company, of Boston, will do the work.

Hamilton, O.—The Garver Contracting & Transfer Co. secured the contract for grading, graveling, curbing, guttering and constructing sidewalks for $8,056.20.

Wilkesbarre, Pa.—The contract for paving Kingston st. was awarded to Richard Rosser for $1,713.12. B. G. Coon was awarded the contract for paving Page st. at $2.37 a sq. yd.

York, Neb.—The M. Ford Co. was awarded the contract for completing the paving in Dist. No. 1, at $2.06 a sq. yd. for brick paving and 70 cts. a ft. for combination curb and gutter.

Youngstown, O.—Contracts were awarded July 13, as follows: Block asphalt paving, Victor Olson; brick paving, Watt st., Geo. T. Prosser; paving and sewering Walnut st., S. H. Degroodt.

St. Joseph, Mo.—Paving contracts have been awarded as follows: Hassam pavement, 8th st., Rackliffe & Gibson, 72½ cts. a sq. yd.; asphalt, 26th

st., Rackliffe & Gibson, $12,782.35.

Baltimore, Md.—The contract for paving Catherine and Hollins sts., was awarded to the Filbert Paving & Construction Co., 18 Builders' Exchange, Baltimore, at $2.20 a sq. yd. for asphalt.

Green Bay, Wis.—The Andrews Asphalt Paving Co., of Hamilton, O., was awarded the contract for paving Ashland ave., with asphalt, for $28,886; E. Mason st., $23,944; School Place, $5,772.

Knoxville, Tenn.—The contract for paving the floor of the Tennessee river bridge was awarded to the Southern Paving Co., of this city, July 8, at $3.30 a sq. yd. for creosoted wood blocks.

Milwaukee, Wis.—The Milwaukee Concrete & Sidewalk Co. was awarded the contract for removing all defective sidewalks in the 16th ward and replacing them with cement walks, at 11 9-10 cts. a sq. ft.

Indianapolis, Ind.—The American Construction Co. was awarded the contract for contructing a macadam roadway on Drexel ave. and for graveling Harlan st.; C. M. Johnson, contract for paving Audubon road with brick.

Topeka, Kas.—The contract for constructing all of the brick paving to be done in this city under this year's petitions, except resurfacing Kansas and Central aves., North Side, was awarded July 15, to H. M. Rice, of St. Joseph, Mo.

Bloomington, Ill.—The Crescent Contracting Co. has been awarded contracts for brick paving, as follows: State st., $1.72 a sq. yd. and 52 cts. a lin. ft. for curb and gutter; Jackson st., $1.74 and 52 respectively; Market st., $1.74½ and 52 cts. respectively.

Racine, Wis.—James Cape & Sons submitted the lowest bid, July 13, for paving Center st. with brick on macadam, at $1.80 a sq. yd. and 55 cts. a lin. ft. for curbing; John O. Jones, on Racine st., at $1.82 for paving and 58 cts. for curbing; R. R. Birdsall, for paving Freeman court with brick on concrete, at $2.10 for paving and 60 cts. for curbing.

Brazil, Ind.—Contracts have been awarded as follows: Cement sidewalks on Depot, McDonald, Hendrix, Illinois, Tennessee and Vermont sts., and paving an alley, Michaels, of Muncie; sidewalks on Park, Halbert, and Compton sts. and Forest ave., Ralph M. Campbell; sidewalks on Morton and Shattuck sts. ,and paving 2 alleys, Kirkpatrick Bros., of Greenfield, Ind.

SEWERS.

Ballinger, Tex.—The Sanitary Sewerage Co. has been incorporated by Tom Ward, J. McGregor, and others.

Ballston Spa, N. Y.—The new sewage disposal system has been completed at at total cost of $100,000.

Wadesboro, N. C.—The Wadesboro Sewerage Co. has been incorporated to construct, repair and keep in operation a sewerage system in this city. The incorporators are: L. J. Huntley, W. M. Liles, H. B. Allen, R. L. Bowman, and J. F. Allen.

CONTEMPLATED WORK.

Antigo, Wis.—A sewer on Edison st. is proposed.

El Reno, Ok.—Voted to issue bonds for building sewer.

Bessemer, Ala.—A storm sewerage system is contemplated.

Jasper, Ala.—The construction of sewers is contemplated.

Detroit, Mich.—The construction of sewers is contemplated.

Millen, Ga.—Plans for a sewerage system have been submitted.

Plankinton, S. D.—Voted to issue bonds for a sewerage system.

Winnebago, Minn.—Voted to issue bonds to construct a sewer here.

Fond du Lac, Wis.—Plans have been adopted for sewer dist. No. 2.

Plankinton, S. D.—Will vote soon on the issue of bonds for sewers.

Albuquerque, N. M.—Plans for a sewerage system are being completed.

Jackson, Mich.—Council approved plans, July 8, for constructing sewers.

Two Harbors, Minn.—Voted to issue bonds for constructing a sewerage system.

Carlisle, Pa.—Plans and specifications for a sewerage system are being prepared.

St. Marys, Pa.—Plans and specification are being prepared for a sewerage system.

Fergus Falls, Minn.—The city engineer has prepared plans for a sewer on Summit ave.

Perry, Ok.—City council decided, July 11, to construct a complete sewerage system.

Blooming Prairie, Minn.—Plans have been prepared for a complete sewerage system.

Oberlin, O.—The question of constructing a sewage disposal plant is being considered.

Birmingham, Ala.—Will vote Sept. 16 on the issue of bonds for constructing sewers.

Alliance, Neb.—The question of constructing a sewerage system is again being discussed.

Aurora, Ind.—Plans for sewers are in preparation by Charles Carroll Brown, Consulting Engineer, Indianapolis, Ind., and City Engineer S. H. McMullen.

Durham, N. C.—Special. Gilbert C. White, C. E., desires catalogues of specialties for sewerage.

Conway, Ia.—Special. This city has engaged W. B. Hazen, C. E., of St. Joseph, Mo., to make surveys and establish system.

Hiawatha, Kas.—Special. Plans for a lateral sewer for this city are being made by W. B. Hazen, C. E., of St. Joseph, Mo.

Shreveport, La.—A resolution has been adopted providing for the extension of the sewerage system. E. R. Bernstein, mayor.

Stillwater, Ok.—A sewerage system is contemplated.

Gas City, Ind.—Bids will be asked soon for constructing a sewerage system.

Tipton, Ind.—Bids will be asked soon for constructing a sanitary sewer.

Yorkton, Sask.—A sewerage system is contemplated.

East, Chicago, Ind.—City council has decided to expend $500,000 in the construction of a new sewer system for Indiana Harbor, which is apart of this city.

Coaldale, Pa.—Plans are being prepared for a pipe sewerage ystem. Dan'l V. McGowan, boro secy.

Chippewa, Wis.—Council adopted an ordinance, July 9, to construct a sewer on Main st. Mayor McCall.

Princeton, Ind.—The plans of E. E. Watts, cy. engr., for a sanitary sewerage system have been approved.

Burlington, Ia.—Council is considering the construction of a 9-in. sewer in alleys in Frick's addition.

Canal Dover, O.—Bids will be asked early this fall for constructing a tile sanitary sewer. J. J. Jurgens, clk.

Winston-Salem, N. C.—Will vote Aug. 6 on the issue of bonds for extensions of the sewer system. Address mayor.

Adel, Ia.—Council is considering the question of constructing an 8-in. pipe sewer. A hearing will be held Aug. 14.

Bloomington, Ill.—Cy. engr. Fauntz has been directed to prepare plans and specifications for a new sewer on Morris ave.

Elkhart, Ind.—The city engineer has been directed to prepare plans and specifications for a storm sewer in Marion st.

Bloomington, Ill.—Resolutions have been adopted providing for the construction of sewers on Monroe ave. and Madison st.

South Haven, Mich.—The question of constructing a sewer on Broadway is under consideration. E. S. Dyckman, pres. B. P. W.

Iron River, Mich.—An ordinance has been passed for constructing a sewer system in various districts. Chas. A. Otto, vil. clk.

Ottawa, Kas.—An ordinance has been passed providing for the extension of the sewer main in 7th st. F. A. Marcell, cy. clk.

East Providence, R. I.—An appropriation was made at the recent town meeting for a comprehensive plan of sewers for this town. Town clk.

Salem, Mass.—City council has authorized the sewerage commission to construct two trunk sewers in South Salem. G. F. Ashton, cy. engr.

Riverside, N. J.—The State sewerage commission has approved plans for a sewerage system and sewerage purification plant for Riverside twp.

Tacoma, Wash.—A recommendation will be made to city council soon providing for the construction of a trunk sewer, at a cost of about $200,000.

Vicksburg, Miss.—City council has engaged Walter G. Kirkpatrick, cy. engr. of Jackson, Miss., to prepare plans and specifications for the proposed sewerage system.

Orange, N. J.—Members of the sewer committee of the councils of this city, Bloomfield, Montclair and Glen Ridge are united in their approval of a big drain.

Montrose, Col.—Special. W. H. Fleming, surv. and engr., advises us that he is interested in sewer pipe and all kinds of concrete work. He contemplates contructing several miles of sewer this year and wants it, if possible, of concrete.

Moundsville, W. Va.—Special. Alonzo P. Carney desires to communicate with the best consulting engineers regarding the proposed construction of a sewerage system for a town of 10,000 population, lying in an undulating valley 2½x3 mis., bounded on the west by the Ohio river, on the south by a creek and divided by a small run. Tunneling for two or more laterals may be necessary.

CONTRACTS TO BE LET.

Olympia, Wash.—Bids are asked until Aug. 5 for constructing 2000 ft. of storm sewers.

Two Rivers, Wis.—Bids are asked until Aug. 6 for constructing a sewer. Cy clk.

Decatur, Ind.—Bids are asked until Aug. 7 for constructing open ditches. Carl O. France, cy. clk.

Emmetsburg, Ia.—Bids are asked until Aug. 19 for constructing a sewer Sim R. Stedman, co. aud.

Waterbury, Conn.—Bids are asked until Aug. 19 for constructing a sewer system. Wm. H. Sandland, cy. clk.

Plainfield, N. J.—Bids are asked until Aug. 5 for constructing storm sewers. Andrew J. Gavett, cy. surv.

Waupaca, Wis.—Sealed bids are asked until 4 p. m. Aug. 3 for constructing sewers. M. H. Duncan, chmn. B. P. W.

Marshfield, Wis.—Bids are asked until Aug. 10 for constructing a sewer in 6th st. M. G. Fleckenstein, cy. clk.

Columbus, Ind.—Bids are asked until Aug. 5 for 9,838 ft. of main and lateral sewers. W. H. Rights, cy. engr.

Lewiston, Mont.—Bids are asked until Aug. 14 for constructing 1½ mi. of sewers. M. D. Kimball, cy. clk.

Bloomfield, Ind.—Bids are asked until Aug. 8 for constructing a sewerage system. Chas. E. Combs, pres. bd. trustees.

Camden, Ark.—Sealed bids are asked until Aug. 15 for constructing 12,000 ft. of sewers. J. S. Rinehart, chmn. bd. impvt.

Grand Forks, S. D.—Sealed bids are asked until Aug. 5 for constructing a lateral sewer in an alley. W. V. O Connor, cy. audt.

New Bremen, O.—Bids are asked until Aug. 3 for constructing about 3,000 ft of sanitary sewers. A. M. Steinebrey, vil. clk.

River Forest, Ill.—Bids are asked until Aug. 5 for constructing a sewer in Chicago ave. F. B. Klock, prest. bl. local impvts.

Willmar, Minn.—Bids are asked until Aug. 12 for constructing 2,520 ft. 12-in. and 1,110 ft. 18-in. pipe sewer. H. Gunderson, cy. clk.

McKeesport, Pa.—Bids are asked until Aug. 6 for removing all dirt, etc., from outlets to sewers along river front. C. E. Soles, cy. contr.

North Milwaukee, Wis.—Bids are asked until Aug. 5 for constructing about 13,000 ft. of 6 to 12-in. pipe sewer. E. W. Thurston, cy. engr.

Alexandria, La.—Bids are asked until Aug. 6 for constructing about 5 mis. of 10, 12, and 14-in. pipe sewers and accessories. Ira W. Sylvester, cy. engr.

New Orleans, La.—Sealed bids are asked until Sept. 11 for constructing 110 mis. of sewers and appurtenances including 1,230 manholes and 443 flush tanks. F. S. Shields, secy. sewerage and water bd.

Westfield, N. J.—Bids are asked until Aug. 5 for constructing 2½ mis. of trunk sewer from the sewage disposal works to a point near Madison Hill Road in Clark twp. A. W. Vars, town clk.

Fayetteville, Ark.—Bids are asked until Aug. 22 for constructing a sewer system. Bd. impvts.

Evansville, Ind.—Bids are asked until Aug. 30 for constructing reinforced concrete or brick sewers, with manholes, inlets, catchbasins, etc., in Kentucky ave. Walter F. Wunderlich, clk. B. P. W.

Willmar, Minn.—Bids are asked until Aug. 12 for constructing 2,250 ft.

21-in. and 1,110 ft. 18-in. pipe sewers. H. Gunderson, cy. clk.

Port Clinton, O.—Bids are asked until Aug. 19 for constructing sewers in dist. No. 9. J. J. Huber, vil. clk.

Morris, Minn.—Bids are asked until Aug. 6 for constructing sewers in dists. Nos. 4, 5, 8, 9, and 20. C. B. Burpee, cy. clk.

Cape Girardeau, Mo.—Bids are asked until Aug. 19 for constructing 12 mis. of sewers in dist. No. 1. Geo. Chapell, cy. clk.

Tagus, Me.—Bids are asked until Aug. 3 for improving the sewerage and drainage system. Maj. A. L. Smith, treas. Eastern Branch N. H. D. V. S.

Westfield, Mass.—Bids are asked until Aug. 3 for constructing 3,250 ft. of 8 to 18-in. pipe sewer, with manholes and catchbasins. Oren E. Parks, town engr.

CONTRACTS AWARDED.

Winfield, Kas.—The contract for building a sewer system was awarded to F. W. Yale, of Coffeyville.

Los Angeles, Cal.—The contract for constructing sewers in various streets has been awarded to W. T. McBride, for $6,838.

Ottawa, Ill.—The contract for constructing the West Side sewer was awarded to Green & Son, of Appleton, Wis., for about $200,000.

Johnson City, Tenn.—The contract for constructing a sewerage system was awarded to the Sands-Key-Ruth Co., of Norfolk, for $22,000.

Milwaukee, Wis.—R. J. Hickey was awarded the contract, July 14, for constructing an 8-in. pipe line sewer in an alley, at 47 cts. a lin. ft.

Hartford, Conn.—The contract for constructing the Ann. st. sewer was awarded, July 15, to the Hartford Paving & Constr. Co., of this city, for $17,391.

Torrington, Conn.—The contract for constructing sanitary sewers was awarded, July 16, to the Pierson Engineering & Construction Co., of Bristol, Conn., for $42,138.

Elbow Lake, Minn.—The contract for constructing sewers and a septic tank was awarded, July 18, to Ilstrup & Olson, 220 Security Bank Bldg, Minneapolis, for $4,083.

Virginia, Ill.—The contract for constructing a large concrete sewer on Morgan st. and a culvert on Washington st. was awarded to J. E. Trowbridge, of Chandlersville.

Steubenville, O.—The Board of Public Service relet the contract, July 8, for constructing the High st. sewer to the Steubenville Stone Co., and for the pipe to the Central Supply Co.

Scranton, Pa.—The contract for constructing section A of the 19th sewer district in the 4th and 5th wards in West Scranton was awarded, July 16, to Fran J. Egli, at $2.63½ a lin. ft. and 75 cts. a ft. for house connections.

St. Joseph, Mo.—The contract for building the 29th st. sewer was awarded, July 8, to Marnell & Son, for $4,620.91, and G. C. Skilbred Construction Co. secured the contract for the Oak Hill extension of the Mitchell ave. sewer.

Washington, D. C.—The contract for constructing junction sections of the B. st. and New Jersey ave. trurk sewers at 10th and 17th sts. and Virginia ave. was awarded to Warren F. Brenizer, of this city, for $10,561 and $3,465, respectively.

Long Island City, N. Y.—Contracts for constructing sewers have been awarded as follows: 1st ave., $2,850; Maple ave,, $1,393; 3rd ave., College Point, 10th st. and 5th ave., $14,535; John F. Clancy, 10th ave. and 14th st., $2,205; John F. Newman, Pearsall st., Gabriel Hill, $7,613.

Horton, Kas.—Special. Bids were received July 4 for constructing 9,315 ft. of lateral sewers, and the contract awarded to T. W. Roberts, of Independence, Mo. The other bidders were G. O. Skilbred, Rackliffe & Gibson, and D. B. Kelly, all of St. Joseph. W. B. Hazen, C. E., St. Joseph.

St. Paul, Minn.—Contracts for constructing sewers were awarded July 8, as follows: Ottawa ave., and Sidney and King sts., D. W. Moore, $10,397; Van Buren st., $1,269, Manitoba ave., $1,110, Litchfield st., $1,173, and Western ave., $772, Nicholas Feyen; Macalester ave., $481, Dale st., $285, Ryan & Johnson.

Dickinson, N. D.—The contract for constructing sewers was awarded to Jas. Kennedy, of Fargo, as follows: 14,982 lin. ft. 8-in. sewers, $1.24; 283 ft. 10-in. $1.35; 366 ft. 12-in. $1.46; 30 straight manholes, $60 each; 7 junction manholes, $70 each; 1 standard flush tank, $170; catchbasins, $70 each; lampholes, $10 each.

Bucyrus, O.—Special. Bids were submitted, July 19, for constructing a sewage disposal plant at the Crawford county Infirmary here, and the contract awarded to Martin Tiner and John Portman, of this city, as follows: excavation, 40 cts. a cu. yd.; brick masonry, $20 a cu. yd.; concrete masonry, $7 a cu. yd.; steel, 6 cts. a pound; lumber in place, $40 per thousand; screen, $6; 8-in. c. i. sluice gates, $8 each; c. i. weir, $1; 5 automatic siphons, $4; vit. sewer pipe, 75 per cent. off list; laying 20-in. sewer pipe, 6 cts. a ft.; laying underdrains, 6 cts. a ft.; lake sand for filters, $2.25 a cu. yd.; total, $1,959.79. E. C. Bradbury and George P. Shute, engrs., 85 N. High st., Columbus, O.

Medina, O.—Special. Bids for constructing sewers in dists. Nos. 1 and 2 and disposal plants for the North and South Sides, were submitted, July 16, as follows: Sewer Dist. No. 1—Ferguson & Purcell, Lorain, O., $8,717.35; H. W. Mathews, $10,731.69; John I. O'Neill, Akron, O., $7,314.55; Wilds & Davison, Akron, $7,533.24; Hitchke & Gibbons, Cleveland, $10,288.41; Joseph Winterbottom, $14,462.41. Sewer Dist. No. 2—Ferguson & Purcell, $25,550.82; H. W. Mathews, $24,685.84; Geo. B. Clifford, $25,836.34; John I. O'Neill, Akron, $19,904; Wilds & Davison, $21,345; Hitchke & Gibbon, Cleveland, $28,003.06 Joseph Winterbottom, $40,381.08. North Side disposal plant—Ferguson & Purcell, Lorain, $3,981.60; H. W. Mathews, $3,930.70; Medina Constr. Co., Medina, $3,768.53. South Side disposal plant—H. W. Mathews, $5,781.10; Ferguson & Purcell, Lorain, $5,382.72; Medina Constr. Co., Medina, $4,880.26. E. C. Bradbury and George P. Shute, engrs., 85 N. High st., Columbus, O.

WATER WORKS.

Gadsden, Ala.—The Gadsden Water Co. has offered its plant to this city for $40,000.

Philadelphia, Pa.—Samuel Gustine Thompson, of this city, arbitrator in

the suit between this city and the McNichol contracting firm over the payment for the construction of parts of the city's filtration system, awarded, July 22, $2,049,336 to that company, which is the greater part of the money retained by the city from the firm, pending a decision of suits entered by the municipality. Mr. Thompson finds that James P. McNichol, a member of the firm, received in profits $51,305 while he was a member of the city councils, which was a violation of the law. Under the award he is to return this amount to the city. Counsel for the city acquiesced in the award, and the money was immediately paid.

Water companies have been incorporated as follows:

Beaumont, Tex.—Beaumont Water Works Co.—W. S. Davidson, A. L. Williams, M. K. Fletcher, R. A. Greer, and P. T. White.

Chicago, Ill.—Nauvoo Water Works Co., to operate water-works plants.—H. T. Wilcoxen, Michael H. Powell and Benjamin P. Ruekberg.

Temple, Tex.—Rodgers Water & Light Co.—John J. Cox, R. L. Brown, W. Arnold, and Thos. G. Brinkley.

New York City—General Water Works & Construction Co., to build water-works and reservoirs.—J. S. Charleston, 1123 Broadway; Charles H. Maxey, 44 Broadway; J. M. Nordstrom, all of this city.

North Wildwood, N. J.—Anglesea Water Co., to operate water-works here.—George Reynolds, Ernest Watts, S. Howard Troth, Camden, N. J.

CONTEMPLATED WORK.

Wadaula, Fla.—A water-works system is proposed.

Girard, O.—A water-works system is contemplated.

Durand, I. T.—A water-works system is contemplated.

Mt. Airy, Ga.—A water-works system is contemplated.

Redmond, Ore.—A water-works system will probably be installed.

Wareham, Mass.—A water-works system will probably be constructed.

Moncton, N. B.—The water-works system will be improved and extended.

Massapequa, N. Y.—Council has decided to construct a water-works system.

Commerce, Ga.—Voted to issue bonds for constructing a water-works system.

Lamar, Colo.—A gravity water-works system from Clay Creek is contemplated.

Brundidge, Fla.—Plans have been submitted to council for a water-works system.

Pleasant Hill, Mo.—The question of a water-works system is being agitated.

Binghamton, Tenn.—A water-works and electric light plant is contemplated.

Paris, Ark.—Bids will be asked soon for constructing a water-works system.

La Grande, Ore.—Surveys are being made for constructing a water-works system.

Dickson, Tenn.—The question of constructing water-works is under consideration.

Niagara Falls, Ont.—The water-works system will be improved. W. J. Seymour, cy. clk.

Lestershire,, N. Y.—The water commissioners are considering the sinking of a well.

Mineral Wells, Tex.—The question of establishing a filtering plant is being considered.

Cottonwood, Idaho.—The business men will install a pumping plant for fire protection.

Tacoma, Wash.—This city will vote Sept. 10 on the Green river gravity water system.

Winder, Ga.—Voted to issue bonds for a water-works system. Plan have been prepared.

Norton, Kas.—Special. W. R. Tasker says he may possibly be in market for new water mains.

Durham, N. C.—Special. Gilbert C. White desires catalogues of water-works specialties.

Eastland, Tex.—The citizens have organized a water-works company and secured a charter to install a water-works plant.

Seattle, Wash.—Plans for installing a system of salt water mains will be prepared by assistant city engineer Scott.

Lawrenceburg, Tenn.—Plans and spcifications are being prepared for a water-works and electric light plant and bids will be asked soon.

Glencoe, Minn.—Special. A. H. Lane is in market for one triplex power pump of 200,000-gal. capacity, 60 to 95-lbs. working pressure.

Montreal, Que.—City council is considering a by-law providing for the borrowing of $2,000,000 to be used in improving the water supply.

Knoxville, Tenn.—The Park City council has asked for 38,000-ft. more of water mains, or more than 7 miles. The city now has about 20,000-ft. of mains.

Canon City, Colo.—Plans have been filed by the Beaver Land & Water Co. for constructing the Bruch Hollow reservoir to be located 12-mis. east of this city.

Omaha, Neb.—Minard L. Holman, of Holman & Laird, St. Louis, Mo., has been engaged to make preliminary plans and estimates for the water-works system for this city.

Brownsville, Tex.—Surveys and plans for a water-works and electric light system are being made by T. R. Batts, C. E., of Bryan, Tex. Will vote on question of building.

Bangor, Me.—The water board has accepted plans for constructing a sedimentation basin at the pumping station and will lay 1,385-ft. of water pipe on the extension of Maple st.

Mechanicsburg, Pa.—Special. H. L. King, supt. Mechanicsburg Gas & Water Co., is in market for a mechanical filtering plant, new dam, 3 new reservoirs, and other improvements.

Bloomington, Ill.—Estimates have been submitted by cy. engr. Fauntz for constructing a 6-in. c. i. water main in W. Washington st. Resolutions have been adopted for laying 12, 15 and 18-in. mains in certain streets.

North Platte, Neb.—Special. Hershey S. Welsh, cy. engr., desires prices on hydrants, c. i. water pipes and specials, pumping engines and boilers suitable for water-works. Also, estimates of cost of constructing water-works plants. This city is considering the advisability of either buying the present water plant or building a new one.

Wyandotte, Mich.—Special. The board of public works is ready to com-

municate with sanitary engineers relative to preparing the necessary plans and specifications for the construction of a filtration plant in connection with the present water-works system. Address all communications to James G. Pinson, sec'y. B. P. W.

CONTRACTS TO BE LET.

Newark, Del.—Bids are asked until Aug. 3 for installing about 6000-ft. of 4-in. water main.

Sibley, Ia.—Bids are asked until Sept. 10 for constructing an open ditch. V. A. Burley, co. audt.

Kenyon, Minn.—Bids are asked until Aug. 5 for improvements to the water system. F. A. Ohs, vil. clk.

Thayer, Ill.—Bids are asked until Aug. 5. for laying 4-in. water pipe with hydrants. vil. clk.

Steelton, Pa.—Bid are asked until Aug. 7. for constructing a filter plant. John D. Young, boro secy.

Sandusky, O.—Bids are asked until Aug. 5 for the sale of a pumping engine. Wm. Ohlemacher, prest. B. P. S.

Russelville, Ark.—Bids are asked until Aug. 20 for constructing waterworks. R. M. Newport, chmn. water comrs.

Perth Amboy, N. J.—Sealed bids are asked until Aug. 7 for furnishing pipe. J. G. Burns, supt. water comrs.

Norwood, O.—Bids are asked until Aug. 3 for furnishing 100 or more meters and connections. L. H. Gebhart, clk. B. P. S.

Chesterton, Ind.—Bids are asked until Aug. 3 (extended from July 20), for constructing a system of water-works. Home Water Co.

New Orleans, La.—Sealed bids are asked until Sept. 4 for laying 250-mis. of 4 to 30-in. c. i. water pipe. Geo. G. Earl, genl. supt.

Decorah, Ia.—Bids are asked until Aug. 5 for constructing a water-works system at the poor farm at Freeport. I. Linnevold, co. audt.

Wahpeton, N. D.—Bids are asked until Aug. 5 for constructing and placing boilers for the water-works plant. Wm. R. Purdon, cy. audt.

New York City—Bids are asked until Aug. 8 for constructing a pumping plant in Forest Park, Queens boro. Moses Herrman, prest. park bd.

Sacramento, Cal.—Competitive plans providing for a filtration plant will be received until Aug. 19. M. J. Desmond, clk. bd. trustees.

Belleplaine, Minn.—Bids are asked until Aug. 6 for constructing 2000-ft. of 4-in. and 2000-ft. of 2-in. water main extension. D. W. McNeal, cy. clk.

Ft. Hancock, N. J.—Bids are asked until Aug. 21 for furnishing and placing a "Cook" strainer in deep well here. M. N. Falls, Supt. and Q. M.

Springfield, Mass.—Sealed bids are asked until Aug. 21 for construction work including intake dam and tunnel, Little River water supply. E. E. Stone, chmn. bd. water comrs.

Philadelphia, Pa.—Bids are asked until Aug. 22 fof constructing preliminary filters at Torresdale, and Roxborough pipe extension system. George R. Stearns, dir. pub. wks.

Catoosa Springs, Ga.—Bids are asked until Aug. 8 for a deep well and water system at the Government Range here. Capt. F. D. Anderson, 12th Calvary, Q. M., Ft. Oglethorp, Ga.

New York City—Sealed bids are asked until Aug. 6 for constructing the main dams for Ashokan reservoir, near Brown's Station, in the towns of Olive and Marbletown, J. Edward Simmons, prest. bd. water sup.

Speed's Addition, Miss.—Bids are asked until Aug. 6 for erecting and sale of complete water-works system or maintenance of water-works and supply for public and private use. T. T. Barber, Speed, P. O., town clk.

Ft. Adams, R. I.—Bids are asked until Aug. 5 for constructing a reservoir 3 shelters for springs, laying pipes from springs to reservoirs at Saunderstown and across Narragansett Bay to Ft. Greble, Dutch Island. Willis C. Metcalf, Q. M.

Columbus, O.—Bids are asked until Aug. 14 for the construction of a reservoir in Summit county, involving 17, 000-cu. yds. of concrete masonry. Chas. E. Perkins, ch. engr.

CONTRACTS AWARDED.

New Holland, Ill.—The contract for constructing a new water-works system here was awarded to G. A. Trenkle for $4,500.

Eunice, La.—The contract for constructing a water-works plant was awarded to P. P. Porter, of Clinton, Ky., for $20,996.

Mt. Carmel, Pa.—The contract for contructing municipal water-works was awarded to James Christiana, of Shamokin, Pa., for $15,000.

Rugby, N. D.—W. D. Lovell, of Minneapolis, Minn., has been awarded the contract for constructing a water-system here, for $9,700.

Salamanca, N. Y.—The contract for the concrete work on the new reservoir was awarded to Casey & Murray, of Rochester, N. Y., for $31,080.

Hastings, Minn.—The contract for constructing a water-works and sewerage system was awarded to J. J. Dunnegan, of Shenandoah, Ia., for $63,526.

Windom, Orchard Park P. O., N. Y.—The contract for constructing a reservoir was awarded to Field, Barker & Underwood, Inc., 514 Arcade Bldg., Phila.

Greenview, Ill.—The contract for constructing a new steel water tower and tank was awarded to the Chicago Bridge & Iron Works, of Chicago, for $3,065.

Mattoon, Ill.—The Mattoon Waterworks & Reservoir Co. has awarded a contract for constructing a reservoir to Loomis & Rose, of this city, for $8,890.

Carthage, N. Y.—The contract for constructing a new water-works system has been awarded to the H. B. Failing Co., of Baldwinsville, N. Y.

Medina, O.—Special. The contract for constructing water pipes and the development of natural filter was awarded to T. C. Brooks & Sons, of Jackson, Mich., for $25,360.16. E. C. Bradbury and George P. Shute, engrs., 85 N. High st., Columbus. O.

Washington, D. C.—The contract for furnishing 5,000 metal covers for water meter boxes was awarded to the Lynchburg Foundry Co., of Lynchburg, Va., at $1.14 each. Other bidders were: Richmond Iron Works, Richmond, Va., $1.20; G. & W. Mfg. Co., New York City, $1.30; H. W. Clark, Mattoon, Ill., $1.98.

Albert Lea, Minn.—Special. Wm. Barneck, cy. engr., says bids for constructing 2,786-ft. of 6-in. water mains were submitted and the contract awarded to Aug. Geisler, of this city, for $3,518. The other bidders were:

W. C. Frazer, Rochester, Minn., $3,897; W. D. Lovell, Minneapolis, $3,800; J. W. Turner Improvement Co., Des Moines, Ia., $4,067.94; E. W. Knatvold, W. E. Bickford, city, $5,565.08.

Wrentham, Mass.—The contract for constructing water-works was awarded to G. Ferrullo & Co., of Boston, at the following bid: 7,000-ft. 10-in. c. i. pipe, including loading, hauling, etc., 29 cts.; 10,000-ft. 8-in. c. i. pipe, 27 cts.; 16,000-ft. 6-in. c. i. pipe, 25 cts.; 2,800-ft. c. i. pipe, 23 cts.; excavation for foundations per cu. yd., 50 cts.; concrete for stand pipe and pump foundation per cu. yd., $5; rock excavation per cu. yd., $3.75; laying service connection and materials per connection, $10.50.

Hamilton, O.—Special. Bids were received, July 18, for improvements to the water-works system, as follows: Chimney, 6-ft. diameter and 150-ft. high, Weber Steel Concrete Construction Co., Chicago, chimney, $3,500, exca., $1 a cu. yd.; H. R. Heinicke Co., New York City, chimney, $3,875, exca., $2 a cu. yd., concrete, $7 a cu. yd.; J. E. Wilson Concrete Co., Cincinnati, chimney, $3,891, exca., 90 cts., concrete, $6.80; Heine Chimney Co., New York City, chimney, $4,183, exca., 60 cts., concrete, $6.25. Receiving well, 50-ft. diam. and 30-ft. deep: W. E. Louthan, Hamilton, exca., 75 cts. a cu. yd. concrete, $5.75 a cu. yd., brick work, $12 a cu. yd., steel, 3¾ cts. a lb., roof, lump sum of $1,000; L. Eid Concrete Co., Cincinnati, exca., 90 cts., concrete, $9.80, brick work $10.50, steel, 7 cts., roof, $1,925; J. B. Wilson Concrete Co., Cincinnati, exca., $1.25, concrete, $9.90, brick work, $12, steel, 5 cts., roof, $3,128. Flange pipe laying: U. S. C. I. Pipe & Foundry Co., Cincinnati, pipe, 4¾ cts. a lb.; W. H. Louthan, Hamilton, laying pipe, $10 per ton.; exca. about receiving well. $1 a cu. yd.; L. Eid Concrete Co., Cincinnati, laying pipe, $10, exca., 65 cts.; J. B. Wilson Concrete Co., Cincinnati, laying pipe, $11, exca., $1.25; John W. Hill, Cincinnati, cons. engr.

BRIDGES.

Bluffton, Ind.—Bids are asked until Aug. 5 for constructing 9 bridges. Co. comrs.

Newton, Kas.—Bids are asked until Aug. 5 for building pile bridges. B. O. Hazen, co. clk.

Valparaiso, Ind.—Bids are asked until Aug. 5 for constructing 3 bridges. Co. comrs.

Brazil, Ind.—Bids are asked until Aug. 6 for constructing a bridge across Eel river. Co. comrs.

Lebanon, Ind.—Bids are asked until Aug. 5 for constructing and repairing 12 bridges. Co. comrs.

Mitchell, S. D.—Bids are asked until Aug. 12 for constructing 6 bridges. H. B. Anderson, co. audt.

Shelbyville, Ind.—Bids are asked until Aug. 5 for repairing several bridges Thos. Hawkins, co. audt.

Bloomington, Ind.—Bids are asked until Aug. 6 for constructing a stone bridge on S. Walnut st. Cy engr. Hanna.

Tipton, Ind.—Bids are asked until Aug. 5 for constructing an abutment and extension of S. Main st. Co. comrs.

Jackson, O.—Bids are asked until Aug. 5 for constructing 6 concrete bridge structures. J. W. Turner, co. surv.

Peru, Ind.—Bids are asked until Aug. 7 for constructing bridges across Big Pipe Creek, near Santa Fe. Co. comrs.

Warsaw, Ind.—Bids are asked until Aug. 7 for contructing 4 steel bridges and 7 pairs of abutments. Co. comrs.

Vicksburg, Miss.—Bids are asked until Aug. 5 for building a steel bridge over Jordan creek. Chancery, clk. Warren co.

New Albany, Ind.—Bids are asked until Aug. 8 for constructing a bridge over Big Indian Creek at Stiller's Ford. Co. comrs.

Washington C. H., O.—Bids are asked until Aug. 3 for constructing a concrete substructure for a bridge over Compton Creek. Co. audt.

New Lexington, O.—Bids are asked until Aug. 6 for constructing a bridge over Rush Creek on Main st. Geo. T. Drake, co. audt.

Purcell, I. T.—The merchants of this city and Lexington are planning the construction of a bridge across the Canadian river.

Crown Point, Ind.—Bids are asked until Aug. 5 for constructing an iron bridge across Duck Creek on Front st. Chas. A. Johnson, co. audt.

Chillicothe, O.—Bids are asked until Aug. 5 for constructing a steel bridge on iron substructure incased in concrete. C. H. Pinto, co. audt.

Anniston, Ala.—Bids will be received at the August term of commissioner's court for building a bridge over Coldwater Creek. W. F. Hanna, prest.

Jefferson, O.—Bids are asked until Aug. 19 for constructing a reinforced concrete bridge in Gates st., Andover village. A. D. Davis, chmn. co. comrs.

Columbus, O.—Sealed bids are asked until Aug. 5 for constructing approaches, substructures and superstructures for a number of bridges. W. C. Cussins, co. audt.

New Albany, Ind.—Bids are asked until Aug. 8 for constructing a bridge across Big Indiana Creek, between Lafayette and Greenville twps. Thos. Hanlon, co. audt.

Findlay, O.—Bids are asked until Aug. 3 for constructing a substructure and superstructure for a steel bridge across Blanchard river. Isaac Hart, chmn. co. comrs.

Newbern, N. C.—Bids are asked until Aug. 5 for constructing a steel highway draw bridge over Swift Creek at Vanceboro, and over Brices Creek here. C. E. Foy, chmn. co. comrs.

Noblesville, Ind.—Bids are asked until Aug. 5 for the repair of Cool Creek and Levi bridges and the construction of a concrete retaining wall at Ohio river bridge. Co. comrs.

Mt. Gilead, O.—Bids are asked until Aug. 5 for constructing the substructure and superstructure of a steel bridge over Whetstone Creek, Westfield twp. W. C. McFarland, co. audt.

Glenwood, Ind.—Sealed bids are asked until Aug. 15 for constructing two 14-ft. spans, concrete and steel foot bridges. Esty Reyburn, prest. bd.; Karl L. Hanson, engr., Connersville.

Cincinnati, O.—Bids are asked until Aug. 6 for constructing a reinforced concrete culvert for Giddings Brook, under East Boulevard. A. R. Callow, secy. B. P. S. Bids are asked until Aug. 16 for repairing culverts on Whiskey Run road. Fred. Dreihs, co. clk.

Cleveland, O.—Sealed bids are asked until Aug. 3 for constructing bridge

work, and until Aug. 10 for constructing a concrete arch culvert in Parma twp. Julius C. Dorn, clk.

Brownstown, Ind.—Bids are asked until Aug. 6 for constructing Crow sewer or bridge substructure on Medora and Sparksville gravel road, to be of stone or concrete. H. W. Wacher, co. audt.

Indianapolis, Ind.—Special. The contract for constructing 3 new park bridges was awarded, July 19, to Hillis F. Hackedorn & Co., of this city, as follows: Across Pogue's run, Spades Place, $2,549; Pogues run, Brookside Park, $5,875; over Pleasant run, Garfield Park, $7,518.

STREET LIGHTING.

Hagerstown, Ind.—Will vote on the question of establishing a municipal electric light plant.

Elyria, O.—Will vote on the question of establishing a municipal electric light plant Aug. 19.

Tampa, Fla.—Special. Chester R. McFarland is in market for a surface condenser for a 375-HP. engine.

Brewton, Ala.—Special. G. E. McCauts is in market for ceiling and desk for 125 fans, 104 volts.

Cleveland Heights, O.—Bids are asked until Aug. 6 for lighting the streets and roads here. W. G. Phare, vil. clk.

Castine, Me.—Special. Geo. A. Benjamin, mgr. Castine Water Co., is in market for a gas engine, power pump, etc.

Wrentham, Mass.—Will vote again on the question of establishing a municipal electric light plant. D. T. Stone, town clk.

Pasadena, Cal.—An underground distributing system for the municipal electric lighting plant is proposed. Mayor Earley.

Lebanon, Pa.—Bids are asked until Aug. 31 for lighting the streets with 150 or more 2000-c. p. arc lamps for 1 to 5-yrs. Police com.

Sioux City, Ia.—Bids are asked until Aug. 6 for lighting the streets with electricity for 5, 7 or 10 yrs. T. W. Payne, chmn. lgt. com.

Macon, Mo.—Special. The superintendent of the electric light and waterworks plant is in market for 200 K. W. alternator, 60 cycle.

Ogden, Utah.—The special committee appointed by council has been given authority to purchase water rights and land necessary to establish a municipal electric light plant.

Calcutta, India.—Bids are asked until Dec. 31 for lighting this town by electricity, gas, oil or other method. It is now lighted by 11,300 24-c. p. and 2,400-c. p. oil lamps. Municipal council.

Winnipeg, Man.—Bids are asked until Sept. 3 for the construction and equipment of the Hydro-Electric Works and Station at Point du Bois, for a transmission line. M. Peterson, secy. bd. control.

Silver City, N. M.—Plans for an electric plant, transmission lines and electric railroad connecting this city with mining camps in the vicinity are being prepared by A. D. Coleman, of Albuquerque.

Calhoun, Ga.—Voted to issue bonds for the establishment of an electric light plant. W. L. Millhouse, mayor.

New York City—Bids are asked until Aug. 5 for conduits, electric wiring and other work in connection with the installation of an electric light and power system for all the buildings under Public Charities dept. Robt. W. Hebberd, comr. charities.

Hickory, N. C.—Bids are asked until Aug. 10 for constructing a concrete reinforced dam with power house, across Catawaba river here, and installing 3,000-h. p. turbine waterwheels and electrical apparatus and transmission lines for lighting and power purposes. M. E. Thornton.

Ft. Wayne, Ind.—The contract for turbines, dynamos and condensers for the new municipal electric light plant was awarded to the Ft. Wayne Electric Co., a local branch of the General Electric Co., of Schenectady, N. Y., for about $50,000. It is estimated that the arc lamps and transformers will increase the cost to $75,000.

Goshen, Ind.—The Indiana & Michigan Electric Co. has absorbed the St. Joseph and Elkhart Power Co., capital $250,000, the Elkhart Electric Co., capital $150,000, and the South Bend Electric Co., capital $150,000. The new company will retain the name of the Indiana & Michigan Electric Co., and will have a capital stock of $1,915,500. The company will furnish light and power in Berrien, Cass, St. Joseph and Van Buren counties, Michigan and in Elkhart, St. Joseph and Laporte counties, Indiana. The directors are Charles A. Chapin, Henry K. Chapin, Homer C. Chapin, Harden D. Crawford, Fred L. Dennis, Charles B. Calvert, Marshall L. Howell, Fred A. Bigam and Richmond Talbott.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Hornell, N. Y.—A garbage crematory is contemplated.

Columbus, O.—Plans have been filed for the proposed municipal garbage disposal.

Youngstown, O.—New ordinance is being prepared for the disposal of garbage for 5-yrs. No bids were received June 29.

Harrisburg, Pa.—Bids are asked until Aug. 5 for the collection and disposal of garbage and ashes for 10-yrs. Seymour S. Eberts, chmn. san. com.

Baltimore, Md.—Special. Col. J. L. Fickes, comr. st. cleaning, says specifications are being prepared for the removal and final disposition of garbage, dead animals and market refuse for a period of 10-yrs. for this city.

PARKS.

Detroit, Minn.—This city has secured a tract of 12 acres for park purposes.

Duluth, Minn.—A small park system is proposed at Duluth Heights, a suburb of this city.

Spokane, Wash.—Plans for a complete system of parks, playgrounds and drives will be made by John C. Olmsted, of Brookline, Mass.

East Orange, N. J.—A resolution has been adopted providing for the purchase and equipment of the Orange Oval for a playground site.

TOO LATE FOR CLASSIFICATION

Sutton, Neb.—W. Treiger, water comr., advises us that he is in the market for a lot of 4 to 6-in. water mains.

Dexter, Mo.—Special. J. J. Dowdy advises us that he may be addressed regarding a drilled artesion well.

Belleville, Ill.—Special. The Belleville Deep Well Water Co., 20 Public Square is in the market for 6-mis. of 12-in. water pipe and a 4,000,000-gal. pumping plant.

La Grande, Ore.—Will vote Sept. 16 on the issue of water bonds.

Sewickley, Pa.—Sealed bids are asked until Aug. 6 for paving Centennial ave. with asphalt block, requiring the following: exca., 1700-cu. yds.; paving, 4830-sq. yds.; new curb, 100-lin. ft.; curb redressed, 700-lin. ft.; curb reset, 2630-lin. ft. Frederick T. Martin, boro engr., 514 Broad st.

York, Neb.—The contract for paving with Galesburg brick was awarded to M. Ford, at $2.06 a sq. yd.

Wichita, Kas.—Sealed bids are asked until Aug. 5 for 2760-sq. yds. of asphalt paving on cement base and 680-cu. yds. of excavation, on 9th st. R. N. Dorr, cy. clk.

Covington, Ky.—An ordinance has been passed for paving Russell ave. with brick, with curbinb and grading. The water main in Madison ave. is to be extended to the south corporation line.

Morgantown, Pa.—The residents of this village are agitating the question of having water brought here from the Morgan spring, a distance of more than 3800-ft. Bd. directors.

Chicago, Ill.—Sealed bids are asked until Aug. 7 for constructing brick and tile pipe sewers, drains, and water service pipes in a large number of streets. H. S. Dietrich, prest. bd. local impvts.

Madison, S. D.—Sealed bids are asked until Aug. 12 for constructing a sewerage system. E. C. Ericson, prest. Regents of Education, Spearfish, S. D.

Port Clinton, O.—Sealed bids are asked until Aug. 19 for constructing a branch sewer in dist. No. 10. J. J. Huber, vil. clk.

Akron, O.—Sealed bids are asked until Aug. 6 for grading, curbing and paving Good st., and for constructing a main trunk sewer and filter bed from the intersection of Bailey ave. with Portage Path to a point in the Summit county Infirmary Farm, and a local sewer in Augusta ave., with catchbasins, lampholes, manholes, ventilators, etc. C. H. Watters, secy. B. P. S.

Chicago, Ill.—Sealed bids are asked until Aug. 6 for paving N. 48th ave. with macadam. John J. Harberg, comr. pub. wks.

Bay City, Mich.—The citizens in S. Wenona ave. are in favor of paving.

Rockford, Ill.—The water-works com. is in favor of erecting a 200-ft concrete chimney, installing 2 new boilers and smoke consumers. The report was adopted.

St. Paul, Minn.—Sealed bids are asked until Aug. 5 for constructing a sewer in Portland ave. John S. Grode, pres. B. P. W.

Janesville, Wis.—The cy. engr. has been directed to investigate the cost of constucting a highway over lots 8, 9, 10, 11, 12, 13 and 14. Plans and specifications for macadamizing St. Lawrence ave. have been adopted and the city attorney authorized to ask for bids for the work.

Bentleyville, Pa.—Blue prints of the original plot of this town are being made preparatory to paving the streets. C. C. Hanlon, engr., Monongahela.

Oshkosh, Wis.—Bids for paving Northwestern ave. with tar macadam were submitted July 22, as follows: J. Rasmussen & Sons Co., grading and tar macadam on concrete base, $1.545 a sq. yd.; Telford base, $2 a sq. yd.; curb and gutter, 59½ cts. a lin. ft.; Chris. Johnson, grading and tar macadam paving, $1.55 a sq. yd.; curb and gutter, 60 cts. a sq. yd.

Eaton, O.—Voted to issue $125,000 worth of bonds for constructing a storm and sanitary sewerage system.

Sterling, Ill.—Sealed bids are asked until Aug. 5 for macadamizing 19 blocks of streets. Fred L. Johnson, chmn. sts. & alley com.

Terre Haute, Ind.—Sealed bids are asked until Aug. 17 for grading and graveling roads. Jerome W. Donehie, co. audt.

Bedford, Ind.—Sealed bids are asked until Aug. 17 for constructing gravel or macadamized roads. Anselm Wood, chmn. vo. comrs. Walter G. Wood, co. audt.

Indianapolis, Ind.—Sealed bids are asked until Aug. 7 for constructing a number of bridges and culverts in Marion county. John E. McGaughey, chmn. co. comrs.; Cyrus J. Clark, co. audt.

Waukesha, Wis.—Sealed bids are asked until Aug. 5 for constructing 395-ft. of pipe sewer, and until Aug. 9 for paving Main st. with brick. John P. Dey, chmn. B. P. W.

New Haven, Conn.—Bids are asked until Aug. 5 for paving Prospect, Sachem and Plymouth sts., with crushed stone, Belgian block gutters, etc. C. W. Kelly, cy. engr.

Quincy, Ill.—Ordinances passed to pave 10th st.

McLeansboro, Ill.—The contract for paving the principal streets was awarded, July 9, to John Cherry, of Jacksonville, Ill., for $96,000.

Oak Park, Ill.—Contracts for constructing 169,000-sq. ft. of concrete sidewalks were awarded to C. D. Smith, of Oak Park, and Edw. Holmstead, of Austin Sta., Chicago, July 16, at 12, 13 and 14 cts. a sq. ft.

Clarinda, Ia.—Bids are asked until Aug. 6 for 1,398-lin. ft. of concrete curb and gutter, and for constructing a reinforced concrete culvert. C. W. Stuart, cy clk.

Madison, Wis.—The attorney general's department held, according to press reports, that the bill legalizing contract for bitulithic paving between the city of Milwaukee and the Central Bitulithic Paving Co. is not unconstitutional.

Central City, Colo.—Bids are asked until Aug. 2 for constructing a wagon road. T. W. Jaycox, State engr., Denver.

Stillwater, Ok.—Bids are asked until Aug. 2 for constructing the superstructure for the repair of the wooden bridge across Cimarron river. co. clk.

Amsterdam, N. Y.—Bids are asked until Aug. 2 for building sewers in several streets. A. T. Young, secy. sewer comrs.